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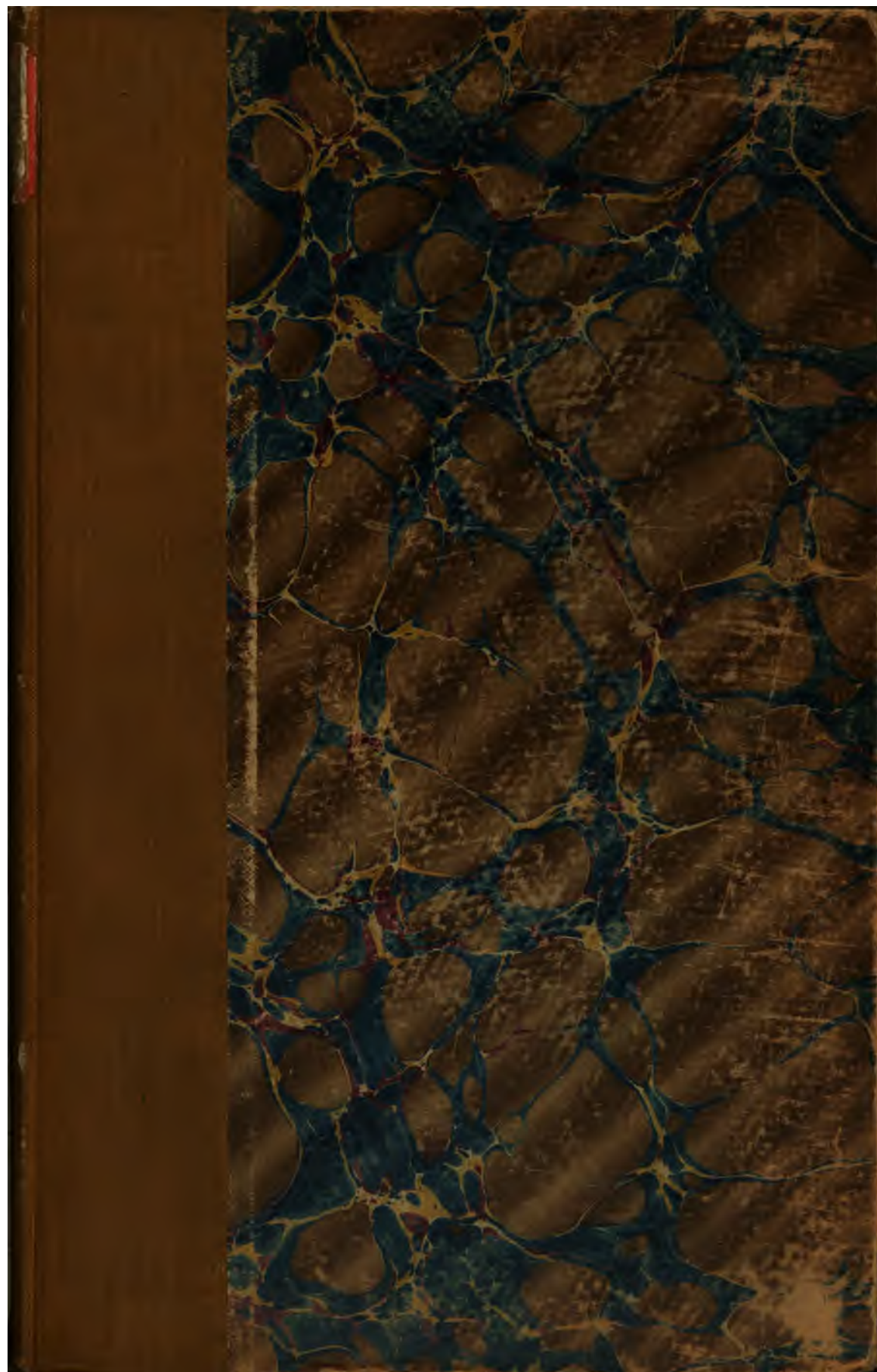
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123
OBSERVATIONS AND CALCULATIONS

AND

FIELD NOTES

OF

THE ESTABLISHMENT OF THE POINT OF INTERSECTION
OF THE TRUE 100TH MERIDIAN WITH
THE RED RIVER.

UNDER THE PROVISIONS OF THE ACT OF JANUARY 15, 1901
(31 STATS., 731).

ARTHUR D. KIDDER,

Examiner of Surveys, General Land Office.

U.S. -

DETERMINATION COMMENCED FEBRUARY 13, 1902.

DETERMINATION COMPLETED APRIL 16, 1902.

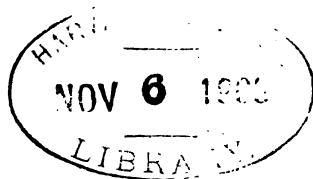
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LETTERS OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., February 5, 1903.

SIR: Respectfully referring to your letter dated May 31, 1901, detailing Arthur D. Kidder, examiner of surveys, to make the necessary observations and calculations and to establish the point of intersection of the true one hundredth meridian with the Red River, under the provisions of the act of Congress approved January 15, 1901 (31 Stats., 731), I have the honor to report that by letter dated January 24, 1903, Mr. Kidder transmitted to this office the complete field notes, in duplicate, of said determination. The said field notes of the observations and calculations for the establishment of the point of intersection of the true one hundredth meridian with the Red River having been examined, it appears that Mr. Kidder has fulfilled the requirements of his instructions from this office, dated February 4, 1902, and the said field notes and the determination they describe have therefore been approved on this date.

* * * * *

I transmit herewith the duplicate copy of said field notes of the establishment of the point of intersection of the true one hundredth meridian with the Red River, in temporary binding, duly approved by this office, for such action as you may desire to take in the matter.

Very respectfully,

W. A. RICHARDS, *Commissioner.*

The honorable SECRETARY OF THE INTERIOR.

DEPARTMENT OF THE INTERIOR,
Washington, February 9, 1903.

SIR: The first section of the act of Congress approved January 15, 1901 (31 Stats., 731), provides as follows:

That the Secretary of the Interior be, and he is hereby, authorized and directed to cause to be established and fixed the intersection of the true one hundredth meridian with Red River, or what, prior to said decision, was known some time as the South Fork of Red River, or Prairie Dog Town Fork, by the most accurate and scientific methods, and at said intersection cause a suitable monument to be erected on the ground.

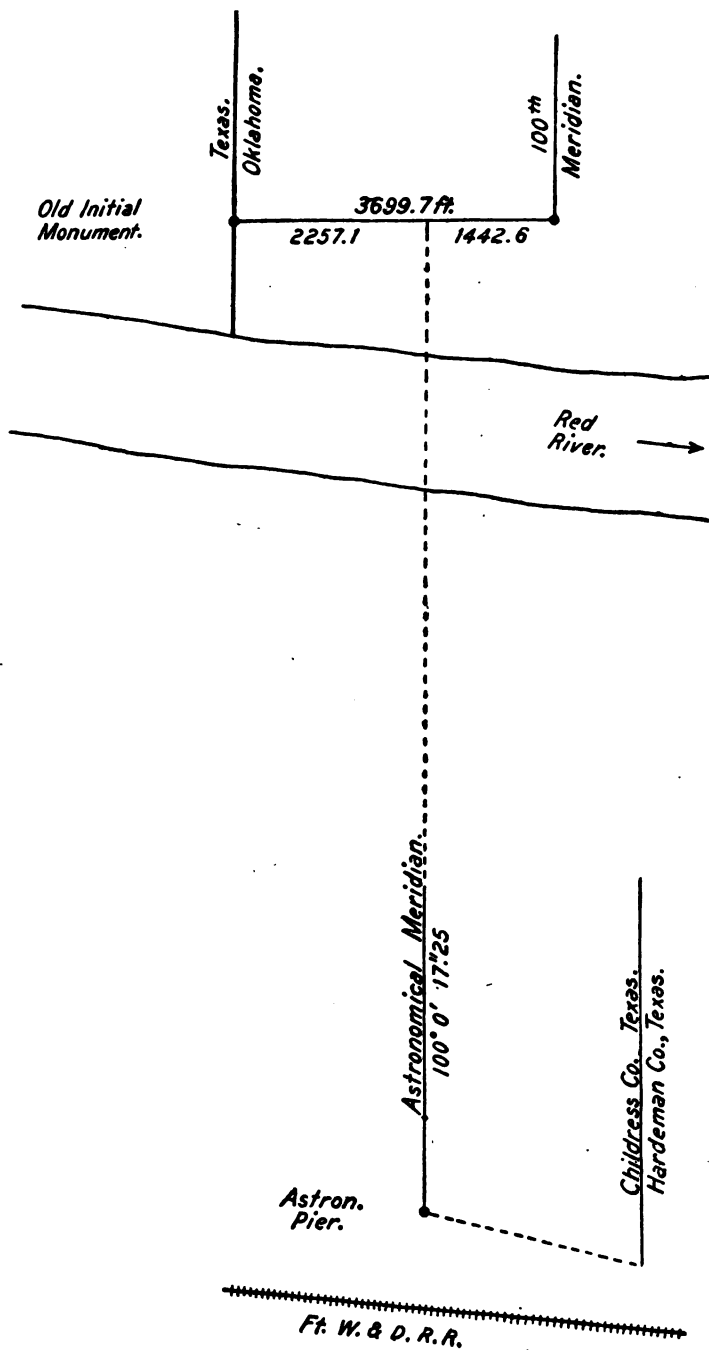
On December 1, 1902, in compliance with the direction thus given, I reported to you that I had caused a determination of the intersection of the true one hundredth meridian with Red River, and the establishment of a permanent monument to mark such intersection, and transmitted with the report a copy of the preliminary report of Arthur D. Kidder, examiner of surveys, who performed the work.

I now have the honor to transmit herewith, as a final report, and for the information of the Congress, a copy of the observations, calculations, and field notes of the establishment of the point of intersection of the true one hundredth meridian with the Red River, by Arthur D. Kidder, examiner of surveys, General Land Office, and a copy of so much of the letter of the 5th instant, from the Commissioner of the General Land Office, as relates to the subject.

Very respectfully,

E. A. HITCHCOCK,
Secretary.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.



ESTABLISHMENT OF THE POINT OF INTERSECTION OF THE TRUE ONE HUNDREDTH MERIDIAN WITH THE RED RIVER.

ASSISTANTS.

AUGUSTUS MACCONNEL,

United States Astronomer, Elmira, N. Y., Assistant Astronomer.

C. N. MCNEILL,

*Superintendent of the Western Union Time Service, St. Louis, Mo., Telegrapher,
St. Louis, Mo.*

F. W. WESSEL,

Western Union Telegraph Company, Denver, Colo., Telegrapher, Red River Observatory.

THE RED RIVER OBSERVATORY.

February 13, 1902, I found the old initial monument of the Texas and Oklahoma boundary, on the crest of the hill that rises to the north from the left bank of the South Fork of the Red River; this monument is—

A combination of gypsum-sandstone 5 by 12 by 18 inches above ground, set in a small mound of stone; marked 100 W on east face, and I M on west face; established by A. H. Jones and H. M. C. Brown, United States surveyors, in 1859, under their contract with the Commissioner of Indian Affairs, dated October 13, 1857.

Latitude, $34^{\circ} 34' 43''.4$; longitude, $100^{\circ} 00' 45''.41$ (preliminary assumption). Values as determined by Prof. Henry S. Pritchett in 1892, and assumed by me in preliminary work. (See printed records in the Supreme Court of the United States in the case involving title to Greer County, Tex., now Greer County, Okla.)

From the initial monument I projected a random meridian south across Red River to an intersection with the Fort Worth and Denver Railroad, about 14 miles distant, where arrangement was made to connect with the wires of the Western Union Telegraph Company.

In the projection of the random meridian, I used transit No. 7058 made by Young & Sons, and equipped with the Smith solar attachment. A solar meridian was determined at every instrument point.

The point of intersection being unfavorable for astronomical observations, a point for the Red River observatory was chosen on a small hill about a quarter of a mile north of the railroad and a little less than half of a mile east of the projected meridian. At this assumed point a concrete pier was built for the meridian telescope, and a small shed opening in the meridian was constructed to protect the instruments.

February 16, 1902, at apparent noon, at the astronomical pier, I set $12^{\circ} 26'$ S. on the decl. arc of the solar and observe the sun on the meridian; the resulting latitude being $= 34^{\circ} 23'$ N., which is the value

used in the following observations and calculations. (No requirement in the longitude determination calling for a more precise determination of the latitude of the place of observation.)

February 16, 1902, at 2^h 0^m p. m. App. T., at the astronomical pier I set 34° 23' N. on the lat. arc of the solar, 12° 24' S. on the decl. arc, and determine the meridian in azimuth, which I mark upon the ground for preliminary work.

From the astronomical pier a sandstone 10 by 12 by 18 inches above ground, marked C. C. on west face and H. C. on east face, bears S. 77° 24' E. 39.54 chains distant; this stone is on the meridian county line between Childress and Hardeman counties, Tex., and lies a few hundred feet north of the Fort Worth and Denver Railroad, the Red River observatory being in Childress County, Tex.

The observatory was established February 18, 1902. The equipment consisted of a Wurdemann meridian telescope, object glass 2½ inches, focal length 24 inches; a Saegmuller chronograph, and a Bond & Son's sidereal break-circuit chronometer No. 568, property of the General Land Office, and a full set of telegraphic instruments, property of the Western Union Telegraph Company.

THE LEVELS.

The meridian telescope is provided with two striding levels:

(1) "Old level," zero at the center of the tube, to be used with a bubble approximately 80 divisions long, the value of 1 division of which I determined on a Saegmuller "level-trier" to be, $d=0''.08$, as follows:

Tabulated trials.

No.	Levels.		Mean difference.	Arc of screw.	Value one division.
	E.	W.			
1	66.0	17.0	48.0	"	"
	18.0	65.0		60	1.250
2	69.4	15.6	43.8	50	1.141
	25.6	59.4			
3	27.0	56.8	36.5	40	1.097
	63.5	20.3			
4	69.8	32.3	34.25	40	1.168
	35.5	66.5			
5	56.2	24.3	32.2	40	1.243
	24.0	56.5			
6	56.0	22.0	32.0	40	1.250
	24.0	54.0			
7	32.0	70.8	26.0	30	1.154
	58.0	44.8			
8	55.5	23.5	24.6	30	1.220
	30.8	48.0			
9	30.0	48.0	19.7	25	1.269
	49.8	28.4			
10	57.5	44.8	12.75	15	1.177
	70.4	32.2			
11	36.8	41.3	12.4	15	1.210
	49.1	28.8			
Mean			1/15	.....	1.198
				$d=$	0''.0799
					0''.08

(2) "New level," zero at the east end when used "direct," and at the west end when used "reversed;" to be used with a bubble approximately 35 divisions long, the value of one division of which I determined on a Saegmuller "level trier" to be $d=0^s.111$, as follows:

Tabulated trials.

No.	Levels.		Mean difference.	Mean of five.	Arc of screw.	Value one division.
	E.	W.				
1	4.6 22.0	39.1 57.0	17.65		"	"
2	22.4 4.7	57.0 39.1	18.80			
3	4.7 21.7	39.1 56.4	17.15			
4	21.7 4.4	56.4 38.8	17.45			
5	4.4 22.2	38.8 56.7	17.85	17.48	30	1.718
6	3.4 21.5	37.6 55.8	18.15			
7	21.6 3.4	55.9 37.6	18.25			
8	3.4 21.2	37.5 55.4	17.85			
9	21.2 3.3	55.5 37.5	17.95			
10	3.3 21.3	37.5 55.5	18.00	18.04	30	1.663
11	4.3 22.6	39.3 57.5	18.25			
12	22.6 3.6	57.4 38.4	19.00			
13	3.5 22.4	38.3 57.4	19.00			
14	22.6 3.4	57.3 38.0	19.25			
15	3.2 21.7	38.0 56.4	18.45	18.79	30	1.597
16	19.5 7.5	58.9 41.8	12.05			
17	7.7 19.4	42.0 58.9	11.80			
18	19.4 7.1	58.8 41.3	12.40			
19	7.2 19.3	41.5 58.7	12.15			
20	19.6 7.0	58.9 41.3	12.60	12.20	20	1.640
21	7.0 19.0	41.2 58.1	11.95			
22	18.5 6.8	52.9 41.1	11.75			
23	6.8 18.5	41.1 52.5	11.55			
24	18.7 6.5	52.9 40.5	12.30			
25	6.5 18.4	40.3 52.5	12.05	11.92	20	1.677

THE ONE HUNDREDTH MERIDIAN.

Tabulated trials—Continued.

No.	Levels.		Mean difference.	Mean of five.	Arc of screw.	Value one division.
	E.	W.				
26	18.5 5.5	52.5 39.4	13.05		"	" 1.718 1.663 1.597
27	5.4 17.8	39.4 51.7	12.35			1.640 1.677
28	17.8 5.6	51.7 39.5	12.20			
29	5.6 17.7	39.5 51.6	12.10			
30	17.7 5.5	51.6 39.3	12.25	12.39	20	1.616
31	10.5 16.4	44.8 50.6	5.85			
32	16.4 10.2	50.6 44.5	6.15			
33	10.6 16.4	44.8 50.5	5.75			
34	16.4 10.0	50.5 44.2	6.35			
35	10.1 16.3	44.3 50.5	6.20	6.06	10	1.650
36	15.7 9.6	49.9 43.8	6.10			
37	9.6 15.7	43.8 49.8	6.05			
38	15.7 9.4	49.9 43.3	6.45			
39	9.0 14.4	43.1 48.5	5.40			
40	14.0 6.7	48.0 40.6	7.35	6.27	10	1.596
41	8.4 14.4	42.0 48.0	6.00			
42	14.4 8.6	48.0 42.0	5.90			
43	8.6 14.5	42.0 48.1	6.00			
44	14.5 9.2	48.1 42.7	5.35			
45	9.1 14.5	42.7 48.0	5.35	5.75	10	1.740
46	1.6					
47	5.0	38.3	3.40			
48	7.7	41.1	2.75			
49	10.9	44.8	3.20			
50	14.3	47.9	3.50			
51	17.1	50.4	2.65			
52	19.7	53.0	2.60			
53	22.5	55.9	2.85			
54		58.2	2.30			
55	22.3	55.5	2.70			
56	19.7	53.0	2.55			
57	17.1	50.4	2.60			
58	14.7	48.0	2.40			
59	10.9	44.2	3.70			
60	7.3	40.5	3.65			
61	4.4	37.4	3.00			
62	0.6		3.80	2.97	5	1.684
Mean ..				1/15	.....	1.658
				d=	.....	0° 1105+
					.....	0° 111

THE WIRE INTERVALS

The reticle of the meridian telescope contains seven wires, but being broadly spaced as suited to eye and ear observations, it was found advisable to use five wires in our chronographic method.

To determine the wire intervals of the meridian telescope, Mr. MacConnel observed 51 Cephei H March 5, 1902, clamp west:

$$\delta = 87^\circ 12' 18''.3$$

$$i'' = \text{equatorial wire interval.}$$

$$I'' = \text{observed wire interval.}$$

$$i = \frac{\sin I'' \cos \delta}{15 \sin 1''}$$

$$\log \cos \delta = 8.688073$$

$$\log 15 = 1.176091$$

$$\log \sin 1'' = 4.685575$$

$$\log (\cos \delta + 15 \sin 1'') = 2.826407$$

Wires.	Chronometer time.	Interval to "mean wire."	I.
	<i>h. m. s.</i>	<i>m. s.</i>	<i>° ' "</i>
1	6 38 33.9	— 15 2.8	3 45 42
2	46 8.1	— 7 28.6	1 52 9
3	53 30.7	— 6.0	1 30
4	7 1 14.6	+ 7 37.9	1 54 28.5
5	8 36.0	+ 14 59.3	3 44 49.5
Mean	6 53 36.7		
	<i>log sin I.</i>	<i>log i.</i>	<i>i''</i>
1	8.816945	1.643352	— 43.99
2	8.513449	1.339656	— 21.87
3	6.639813	9.466225	— 0.29
4	8.522358	1.348763	+ 22.32
5	8.815261	1.641668	+ 43.82

THE ST. LOUIS OBSERVATORY.

The observatory of the Washington University at St. Louis, Mo., was chosen as the reference observatory, and Chancellor W. S. Chaplin, of the University, kindly granted the use of their instruments to the United States for the determination.

Latitude = $38^\circ 38' 3''$.0; longitude = $6^h 00^m 49^s$.168 (Standard).

The equipment of the St. Louis observatory used by us was their Fauth transit instrument, object glass $2\frac{1}{4}$ inches, focal length 39 inches; a Warner and Zwazey chronograph; and their large sidereal break-circuit clock. The Western Union Telegraph Company also installed a full set of telegraphic instruments at the St. Louis observatory and connected both observatories to their wires.

THE LEVEL.

The St. Louis transit is provided with an accurate striding level, zero at the center; to be used with a bubble approximately 20 divisions long; 1 division of the level is: $d = 0''$.136.

WIRE INTERVALS.

The seven wires of the reticle of the St. Louis transit are properly spaced for chronographic work, and all were used, the wire intervals, clamp west, are:

1	—13.428 ^s	5	+ 4.432 ^s
2	— 8.911	6	+ 8.927
3	— 4.466	7	+13.456
4	— 0.010		

The above values for the level and wire intervals were kindly furnished by Professor Lichter, astronomer, Washington University.

PROGRAMME.

The nightly programme consisted in the determination of the precise error of each local sidereal timepiece in order to ascertain the absolute sidereal time at each station at the epoch of exchanging time signals.

A carefully prepared list of twelve stars was chosen for observation from the American Ephemeris, the same stars being observed at both stations. The star list was divided into two parts of six stars each, and each part contained five time stars and one azimuth star.

Between the halves of the star programme the Western Union Telegraph Company opened direct wire service from the St. Louis to the Red River observatories, and with the assistance of expert telegraphers, we were able to compare the St. Louis clock with the Red River chronometer by double electric exchanges consisting of thirty arbitrary signals sent in each direction.

At both observatories, during the observations of the stars, and the exchanging of time signals, the beats of the local sidereal timepiece were being continuously recorded on the local chronograph sheet; the observations of the star transits for each wire of the reticle were recorded by the respective local chronographs; the arbitrary exchange signals were recorded by *both* chronographs.

DETERMINATION AND ELIMINATION OF ERRORS.

1. Clock and chronometer rate to the epoch of exchange: The exchange of time signals being made as nearly as possible at the mean epoch of the evening's programme, and the reduction of the chronometer and clock correction being for the mean epoch of the evening's programme, very little error could arise from even neglecting the rate; complete preliminary reductions were made, however, during the entire period of the observations from March 5 to April 7, inclusive, and having thus a basis for computing the true chronometer rate and the true clock rate for this period, a second reduction was made of all the observations in which the rate correction to the actual epoch of exchange was introduced. This correction is applied directly to the mean observed transit of each individual star, and in this way the subsequent corrections apply to the epoch of exchange. The reductions herewith are the second or final reductions of the observations.

2. Aberration: The mean observed transit of every star was corrected for diurnal aberration, the correction being subtractive for all stars observed at upper culmination as were the stars in our programme.

The correction is:

$$K = 0.021 \cos \varphi \sec \delta$$

3. Level: The level errors of the horizontal axis of both transits, or "b" factors, were obtained every evening from sixteen readings of the striding levels; four readings in double direct and reversed position of the level were taken at the beginning and end of each half set of the observing programme.

The zero being at the center of the St. Louis level, and the old Wurdemann level, the factor "b" for these levels is given by the equation:

$$b = 1/8 (\Sigma W - \Sigma E) d$$

The new level was used exclusively at the Red River observatory, and as the zero of this level is at the east end "direct," the factor "b" is given by the following equation:

$$b = 1/8 (\Sigma \text{Dir.} - \Sigma \text{Rev.}) d.$$

The above equations are designed for four readings of the level and a + value of "b" indicates that the west end of the horizontal axis of the transit is higher than the east end.

The mean observed transit of every star was corrected for level, the correction being:

$$K = b \frac{\cos(\varphi - \delta)}{\cos \delta} = bB$$

4. Right ascension: The three corrections above having been applied to the mean observed transit of every star, the difference was then taken between the chronometer time of the transit of each star as thus reduced and the respective right ascension of the star for the evening, this difference being called our "1st approximation" to the chronometer correction for the evening.

The very small errors due to the adopted right ascension as taken from the Ephemeris were eliminated by observing the same stars at both observatories.

5. Collimation: The transit instruments were both reversed in their Y's at the end of the first half of the programme each evening, and the second half was observed with the transit in reversed position. The five time stars of each half set were so chosen as to make their mean position in declination as close as possible to the zenith, thereby enabling an almost complete elimination of errors due to azimuth in the mean of the five "1st approximations" of the time stars of each half set; the collimation error being opposite for each half set we determined the "c" factor for the evening by taking the difference between the mean "1st approximations" for each half set and dividing this difference by the sum of the mean "C" factors of each half set:

$$c = \frac{\begin{array}{c} \text{Mean} \\ \text{Dir.} \end{array} \begin{array}{c} \text{1st approx.} \\ C \end{array} - \begin{array}{c} \text{Mean} \\ \text{Rev.} \end{array} \begin{array}{c} \text{1st approx.} \\ C \end{array}}{\begin{array}{c} \text{Mean} \\ \text{Dir.} \end{array} C + \begin{array}{c} \text{Mean} \\ \text{Rev.} \end{array} C}$$

The correction is + when the mean fictitious wire of the reticle is too far west. Having computed the "c" factor, the correction for collimation for each star was given by the equation:

$$K = c \frac{1}{\cos \delta} = cC$$

Errors due to any slight inequality of the pivots of the horizontal axis of each transit were also eliminated by the reversal of the transit in its Y's between the halves of the evening's observing programme.

6. Azimuth: Having solved and applied the collimation correction to the 1st approximation of the chronometer correction of each star, the result is called "Correction + aA ;" the azimuth error or " a " factor was then computed for each half set by solving an equation involving the mean results obtained from the five-time stars as compared with a similar result obtained from the slow moving azimuth star of that set:

$$a = \frac{\frac{\text{Mean of Time Stars} (\text{Cor} + aA)}{A} - \frac{\text{Azimuth Star} (\text{Cor} + aA)}{A}}{\frac{\text{Mean of Time Stars}}{A} - \frac{\text{Azimuth Star}}{A}}$$

The correction is + when the west end of the axis is too far south. The azimuth correction was then computed by the equation:

$$K = \frac{a \sin (\varphi - \delta)}{\cos \delta} = aA$$

Having applied the azimuth correction given by " a " to the "Correction + aA ," of each star, the result is the "chronometer correction" as given by the respective star.

The mean correction as thus obtained from the ten time stars gave the true chronometer correction to be applied to the mean observed epoch of exchange of time signals on that evening.

7. Exchange of time signals: The Western Union Telegraph Company were previously informed of the exact moment when we desired to exchange our time signals. A few minutes before this moment arrived the company cleared the entire circuit for our use, and when all was in readiness thirty arbitrary signals, at intervals of about two seconds, were sent from Red River to St. Louis by breaking the main-line circuit with the key at Red River. Then thirty similar signals were sent from St. Louis to Red River. The sixty signals were recorded by both chronographs.

As the period of sending signals from each station embraced an even minute, any slight eccentric chronometric or chronographic errors were eliminated, and the mean of so many signals enabled a precise calculation of the "mean epoch of exchange."

Errors due to transmission time of the electric impulse were eliminated by taking the mean of the differences of the local sidereal time between St. Louis and Red River as given by the signals sent in the opposite directions. The signals sent from Red River made the difference in longitude appear too great; the signals sent from St. Louis made the difference in longitude appear too small. Half the difference of the differences as thus obtained is equal to the transmission time. The transmission time varies from night to night as a result of the weather and other conditions along the thousand miles of wire connecting the two observatories.

On April 4 and 7 the circuit was made up via Kansas City and Dallas; on the other nights direct via Dallas.

The service furnished by the Western Union Telegraph Company was perfect in every way and complimentary to the United States.

8. Personal equation: During the first five observations and exchanges Mr. MacConnel observed at Red River and I observed at St. Louis. We then exchanged places, and Mr. MacConnel conducted the latter five observations at St. Louis and I observed at Red River. In this manner we eliminated our "relative personal equation" in so far as it is possible to do so. It appears from the results, however, that our relative personal equation is very small.

ADJUSTMENTS.

Preliminary adjustments were made of both transits in order to reduce the errors in level, collimation, and azimuth to a minimum before commencing to exchange time signals.

Between March 5 and 14 I readjusted the St. Louis transit in collimation, and Mr. MacConnel readjusted the Red River transit in azimuth and collimation.

Between March 18 and 26 Professor Lichter, of Washington University, St. Louis, in undertaking to correct the rather large losing rate of the St. Louis clock caused a greater gaining rate.

The weather being very mild at Red River between March 26 and April 7, the rate of the Red River chronometer was so small as to be factorless in the reductions during this period.

MARCH 5, 1902, KIDDER, ST. LOUIS.

Levels.

CLAMP WEST.

	W.	5 ^h 0 ^m	E.	W.	7 ^h 30 ^m	E.
Dir.	10.0		9.8	8.3		10.0
Rev.	10.8		9.0	11.6		6.8
Rev.	10.0		9.5	11.4		7.0
Dir.	9.7		10.0	8.8		10.0
Sum	40.5		38.3	40.1		33.8
Diff.		+2.2			+6.3	
$\frac{1}{s}$		0.275			0.787	
d		0 ^h .136			0 ^h .136	
b		+0.04			+0.11	

CLAMP EAST.

	W.	8 ^h 0 ^m	E.	W.	9 ^h 50 ^m	E.
Dir.	8.1		10.0	8.4		10.6
Rev.	12.0		6.5	11.0		8.0
Rev.	11.6		6.8	11.0		8.0
Dir.	8.0		10.0	8.6		10.4
Sum	39.7		33.3	39.0		37.0
Diff.		+6.4			+2.0	
$\frac{1}{s}$		0.8			0.25	
d		0 ^h .136			0 ^h .136	
b		+0.11			+0.03	

MARCH 5, 1902, KIDDER, ST. LOUIS—Continued.

Star		α Aurigæ, $\delta=45^{\circ} 54'$				β Tauri, $\delta=28^{\circ} 32'$				
Factors	A	-0.18	a	=	-.30	A	+0.20	a	=	-.30
	B	+1.43	b	=	+.05	B	+1.12	b	=	+.06
	C	+1.44	c	=	$\begin{cases} -1.79 \\ -.12 \end{cases}$	C	+1.13	c	=	$\begin{cases} -1.79 \\ -.12 \end{cases}$
Wires.		Chron. T.				Chron. T.				
		h.	m.	s.		h.	m.	s.		
1		5	7	26.9		5	18	9.3		
2				33.4				14.2		
3				39.6				19.1		
4				46.2				24.5		
5				52.6				29.5		
6				58.9				34.6		
7		8		5.5				39.6		
Mean		5	7	46.16		5	18	24.40		
Rate				-.12				-.11		
Aber.				-.03				-.02		
bB				+.07				+.07		
cC				-2.57				-2.02		
RA		5	7	43.51		5	18	22.32		
		5	9	28.90		5	20	7.51		
1st App.		+1		45.39		+1		45.19		
cC				-.17				-.13		
Cor.+aA		1		45.56		1		45.32		
aA				+.05				-.06		
Slow		1		45.51		1		45.38		
Star		χ Aurigæ, $\delta=32^{\circ} 7'$				ν Aurigæ, $\delta=39^{\circ} 7'$				
Factors	A	+0.12	a	=	-.30	A	-0.02	a	=	-.30
	B	+1.17	b	=	+.07	B	+1.29	b	=	+.08
	C	+1.18	c	=	$\begin{cases} -1.79 \\ -.12 \end{cases}$	C	+1.29	c	=	$\begin{cases} -1.79 \\ -.12 \end{cases}$
Wires.		Chron. T.				Chron. T.				
		h.	m.	s.		h.	m.	s.		
1		5	24	24.0		5	42	43.6		
2				29.2				49.4		
3				34.3				55.1		
4				39.6		43		1.0		
5				44.8				6.5		
6				50.1				12.4		
7				55.6				18.2		
Mean		5	24	39.64		5	43	0.89		
Rate				-.10				-.08		
Aber.				-.02				-.02		
bB				+.08				+.10		
cC				-2.11				-2.30		
RA		5	24	37.49		5	42	58.59		
		5	26	22.75		5	44	43.90		
1st App.		+1		45.26		+1		45.31		
cC				-.14				-.15		
Cor.+aA		1		45.40		1		45.46		
aA				-.04				+.01		
Slow		1		45.44		1		45.45		

MARCH 5, 1902, KIDDER, ST. LOUIS—Continued.

Star	51 Cephei, $\delta=87^{\circ} 12'$			α^2 Gemin., $\delta=32^{\circ} 6'$		
Factors	A=-15.36	a=-.30		A=+0.12	a=-.30	
	B=+13.56	b=+.11		B=+1.17	b=+.11	
	C=+20.49	c= $\begin{cases} -1.79 \\ -.12 \end{cases}$		C=+1.18	c= $\begin{cases} -1.79 \\ -.12 \end{cases}$	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	6	49	19.0	7	26	24.3
2		50	49.8			29.6
3		52	22.0			35.0
4		53	53.5			40.0
5		55	26.0			45.5
6		56	56.9			50.5
7		58	29.6			55.8
Mean	6	53	53.83	7	26	40.10
Rate			-.01			+.03
Aber.			-.34			-.02
bB			+1.49			+.13
cC			-36.60			-2.11
RA	6	53	18.37	7	26	38.13
	6	55	6.04	7	28	23.26
1st App.		+1	47.67		+1	45.13
cC			-2.41			-.14
Cor.+aA		+1	50.08		1	45.27
aA						-.04
Slow					1	45.31
Star	ζ^1 Cancri, $\delta=17^{\circ} 57'$			η Cancri, $\delta=20^{\circ} 46'$		
Factors	A=+0.37	a=-.135		A=+0.33	a=-.135	
	B=+0.98	b=+.10		B=+1.02	b=+.09	
	C=+1.05	c= $\begin{cases} +1.79 \\ +.12 \end{cases}$		C=+1.07	c= $\begin{cases} +1.79 \\ +.12 \end{cases}$	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	8	4	36.3	8	25	3.4
2			40.8			7.9
3			45.2			12.7
4			50.1			17.5
5			54.8			22.3
6			59.7			27.0
7	5		4.1			31.5
Mean	8	4	50.20	8	25	17.47
Rate			+.07			+.09
Aber.			-.02			-.02
bB			+.10			+.09
cC			+1.88			+1.91
RA	8	4	52.23	8	25	19.54
	8	6	37.86	8	27	4.95
1st App.		+1	45.63		+1	45.41
cC			+.12			+.13
Cor.+aA		1	45.51		1	45.28
aA			-.05			-.04
Slow		1	45.56		1	45.32

Clamp East.

MARCH 5, 1902, KIDDER, ST. LOUIS—Continued.

Star	γ Cancri, $\delta=21^{\circ} 49'$			ι Ursae Maj., $\delta=48^{\circ} 26'$		
Factors	A=+0.31	a= - .135		A=-0.26	a= - .135	
	B=+1.03	b= + .08		B=+1.47	b= + .07	
	C=+1.08	c= $\begin{cases} +1.79 \\ +.12 \end{cases}$		C=+1.50	c= $\begin{cases} +1.79 \\ +.12 \end{cases}$	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	8	35	37.4	Lost.		
2			42.4	8	50	31.4
3			47.2			37.6
4			51.9			44.5
5			56.8			51.2
6	36		1.4			57.9
7			6.3	Lost.		
Mean	8	35	51.83	8	50	44.51
Rate			+ .10			+ .12
Aber.			- .02			- .03
bB			+ .08			+ .10
cC			+1.93			+2.68
RA	8	35	53.92	8	50	47.38
	8	37	39.39	8	52	33.02
1st App.			+1 45.47			+1 45.64
cC			+ .13			+ .18
Cor. + aA	1		45.34	1		45.46
aA			- .04			+ .04
Slow	1		45.38	1		45.42
Star	1 Draconis, $\delta=31^{\circ} 46'$			μ Leonis, $\delta=26^{\circ} 28'$		
Factors	A=-4.77	a= - .135		A=+0.23	a= - .135	
	B=+5.09	b= + .06		B=+1.09	b= + .05	
	C=+6.98	c= $\begin{cases} +1.79 \\ +.12 \end{cases}$		C=+1.11	c= $\begin{cases} +1.79 \\ +.12 \end{cases}$	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	19	46.0	9	45	11.6
2		20	16.4			16.4
3			47.3			21.6
4	21		17.9			26.1
5			50.0			31.2
6	22		20.4			36.3
7			51.9			41.3
Mean	9	21	18.56	9	45	26.33
Rate			+ .15			+ .18
Aber.			- .11			- .02
bB			+ .31			+ .05
cC			+12.48			+1.98
RA	9	21	31.39	9	45	28.52
	9	23	18.26	9	47	14.01
1st App.			+1 46.87			+1 45.49
cC			+ .81			+ .13
Cor. + aA	1		46.06	1		45.36
aA						- .03
Slow				1		45.39

MARCH 5, 1902, KIDDER, ST. LOUIS—Continued.

Computations.

"c"

Star.	Clamp W.		C.	Star.	Clamp E.		C.
	1st App.				1st App.		
	m.	s.			m.	s.	
α Aur.	+1	45.39	+1.44	ζ^1 Can.	+1	45.63	+1.05
β Tau.		.19	1.13	η Can.		.41	1.07
χ Aur.		.26	1.18	γ Can.		.47	1.08
ν Aur.		.31	1.29	ι U. M.		.64	1.50
α^2 Gem.		.13	1.18	μ Leo.		.49	1.11
Mean	1	45.26	1.24	Mean	1	45.53	1.16

$$c = \frac{(1^m 45^s.26) - (1^m 45^s.53)}{1.24 + 1.16}$$

$$c = -0.12 \text{ Clamp W.}$$

$$c = +0.12 \text{ Clamp E.}$$

"a"				"a"			
Star.	Clamp West.		A	Star.	Clamp East.		A
	Cor. + αA				Cor. + αA		
	m.	s.			m.	s.	
α Aur.	+1	45.56	— 0.18	ζ^1 Can.	+1	45.51	+0.37
β Tau.		.32	+ 0.20	η Can.		.28	+0.33
χ Aur.		.40	+ 0.12	γ Can.		.34	+0.31
ν Aur.		.46	— 0.02	ι U. M.		.46	—0.26
α^2 Gem.		.27	+ 0.12	μ Leo.		.36	+0.23
Mean	+1	45.40	+ 0.05	Mean	+1	45.39	+0.20
51 Cep.	1	50.08	—15.36	1 Drac.	1	46.06	—4.77
Diff.	— 4.68		+15.41	Diff.	— 0.67		+4.97

$$a = \frac{-4.68}{15.41}$$

$$a = -0.30$$

$$a = \frac{-0.67}{4.97}$$

$$a = -0.135$$

Chronometer corrections.

	m.	s.	
α Aurigæ slow	1	45.51	
β Tauri slow		.38	
χ Aurigæ slow		.44	
ν Aurigæ slow		.45	
α^2 Gemin. slow		.31	
ζ^1 Cancræ slow		.56	
η Cancræ slow		.32	
γ Cancræ slow		.38	
ι Ursæ Maj. slow		.42	
μ Leonis slow		.39	
Mean slow	1	45.42	Epoch 7 ^h 0 ^m .
Chron. slow	1	45.40	Epoch of exchange.

THE ONE HUNDREDTH MERIDIAN.

MARCH 5, 1902, KIDDER, ST. LOUIS—Continued.

Exchange signals received at St. Louis.

From Red River.			From St. Louis.						From Red River.			From St. Louis.		
h.	m.	s.	h.	m.	s.				h.	m.	s.	h.	m.	s.
6	42	11.11	6	46	0.80				6	42	47.14	6	46	37.02
		13.11			2.87						49.17			39.05
		15.20			4.92						51.14			40.93
		17.15			6.99						53.15			42.90
		19.18			9.02						55.14			45.00
		21.20			11.00						57.15			46.97
		23.20			13.00						59.16			48.90
		25.20			15.00				43		1.17			50.94
		27.15			16.85						3.20			52.90
		29.18			18.85						5.20			54.83
		31.15			20.83						7.22			56.88
		33.13			22.95						9.10			58.96
		35.15			25.00									
		37.14			27.00	Mean	6	42	40.16			6	46	29.95
		39.11			28.98	Chr. slow	+	1	45.40			+	1	45.40
		41.20			31.00									
		43.10			33.04	Correct	6	44	25.56			6	48	15.35
		45.14			35.02									

MARCH 5, 1902, MACCONNEL, RED RIVER.

Levels.

CLAMP WEST.

	Dir.	5 ^h 0 ^m	Rev.	Dir.	5 ^h 46 ^m	Rev.
W.	47.3		2.5	50.0		1.5
E.	8.5		42.0	9.3		42.0
W.	47.0		2.5	48.0		1.7
E.	7.8		42.0	7.1		42.2
Sum	110.6		89.0	114.4		87.4
Diff.		+21.6			+27.0	
1/8		2.70			3.37	
d		0 ^o .111			0 ^o .111	
b		0.30			0.37	
	Dir.	6 ^h 50 ^m	Rev.	Dir.	7 ^h 42 ^m	Rev.
W.	54.8		9.0	59.0		7.0
E.	7.0		51.0	15.1		51.0
W.	57.0		9.0	58.1		6.9
E.	14.8		51.0	14.1		50.8
Sum	133.6		120.0	146.3		115.7
Diff.		+13.6			+30.6	
1/8		1.70			3.82	
d		0 ^o .111			0 ^o .111	
b		0.19			0.42	

CLAMP EAST.

	Dir.	8 ^h 0 ^m	Rev.	Dir.	9 ^h 50 ^m	Rev.
W.	57.0		8.1	53.0		14.9
E.	13.2		52.0	22.5		44.9
W.	57.6		8.0	53.0		15.1
E.	13.4		52.0	22.5		45.2
Sum	141.2		110.1	151.0		120.1
Diff.		+31.1			+30.9	
1/8		3.89			3.86	
d		0 ^o .111			0 ^o .111	
b		0.43			0.42	

MARCH 5, 1902, MACCONNEL, RED RIVER—Continued.

Clamp West.

Star	χ Aurigæ, $\delta=32^{\circ} 7'$			51 Cephei, $\delta=87^{\circ} 12'$		
Factors	A=+0.04	a=+1.35		A=-16.32	a=+1.35	
	B=+1.18	b=+ .34		B=+12.38	b=+ .24	
	C=+1.18	c=+ .28		C=+20.49	c=+ .28	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	5	23	47.1	6	38	33.9
2		24	13.6		46	8.1
3			38.9		53	30.7
4		25	5.3	7	1	14.6
5			30.7		8	36.0
Mean	5	24	39.12	6	53	36.66
Rate			-.03			+ .03
Aber.			-.02			-.35
bB			+ .40			+2.97
RA	5	24	39.47	6	53	39.31
	5	26	22.75	6	55	6.03
1st App.		+1	43.28		+1	26.72
cC			+ .34			+5.82
Cor.+aA		1	42.94		1	20.90
aA			+0.5			
Slow		1	42.89			
Star	α^2 Gemin., $\delta=32^{\circ} 6'$			β Gemin., $\delta=28^{\circ} 16'$		
Factors	A=+0.04	a=+1.35		A=+0.12	a=+1.35	
	B=+1.18	b=+ .29		B=+1.13	b=+ .34	
	C=+1.18	c=+ .28		C=+1.13	c=+ .28	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	7	25	47.9	7	36	47.7
2		26	13.7		37	12.7
3			39.1			37.2
4		27	5.8		38	3.2
5			31.5			27.4
Mean	7	26	39.60	7	37	37.64
Rate			+ .05			+ .06
Aber.			-.02			-.02
bB			+ .34			+ .38
RA	7	26	39.97	7	37	38.06
	7	28	23.25	7	39	21.55
1st App.		+1	43.28		+1	43.49
cC			+ .34			+ .32
Cor.+aA		1	42.94		1	43.17
aA			+ .05			+ .16
Slow		1	42.89		1	43.01

MARCH 5, 1902, MACCONNEL, RED RIVER—Continued.

Clamp East.

Star	ζ' Cancri, $\delta=17^\circ 57'$			η Cancri, $\delta=20^\circ 46'$		
Factors	A=+0.30 a =+1.30 B=+1.01 b =+ .43 C=+1.05 c =- .28			A=+0.26 a =+1.30 B=+1.04 b =+ .43 C=+1.07 c =- .28		
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	8	4	8.5	8	24	34.6
2			31.1			57.6
3			55.0		25	22.1
4	5		17.5			45.0
5			40.6		26	8.7
Mean	8	4	54.54	8	25	21.60
Rate			+ .08			+ .09
Aber.			- .02			- .02
bB			+ .43			+ .45
RA	8	4	55.03	8	25	22.12
	8	6	37.86	8	27	4.95
1st App.		+1	42.83		+1	42.83
cC			- .30			- .30
Cor. +aA		1	43.13		1	43.13
aA			+ .39			+ .34
Slow		1	42.74		1	42.79
Star	γ Cancri, $\delta=21^\circ 49'$			ϵ Ursae Maj., $\delta=48^\circ 26'$		
Factors	A=+0.24 a =+1.30 B=+1.05 b =+ .43 C=+1.08 c =- .28			A=-0.36 a =+1.30 B=+1.45 b =+ .42 C=+1.49 c =- .28		
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	8	35	8.9	8	49	44.2
2			32.2		50	16.6
3			56.4			50.5
4	36		19.6		51	23.5
5			43.4			56.4
Mean	8	35	56.08	8	50	50.24
Rate			+ .10			+ .11
Aber.			- .02			- .03
bB			+ .45			+ .64
RA	8	35	56.61	8	50	50.96
	8	37	39.39	8	52	33.02
1st App.		+1	42.78		+1	42.06
cC			- .31			- .42
Cor. +aA		1	43.09		1	42.48
aA			+ .31			- .47
Slow		1	42.78		1	42.95

MARCH 5, 1902, MACCONNEL, RED RIVER—Continued.

Star	1 Draconis, $\delta=81^\circ 46'$			μ Leonis, $\delta=26^\circ 28'$		
Factors	A=-5.13	a=+1.30		A=+0.16	a=+1.30	
	B=+4.73	b=+ .42		B=+1.10	b=+ .42	
	C=+6.98	c=- .28		C=+1.11	c=- .28	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	16	36.5	9	44	41.4
2		19	6.8		45	5.5
3		21	43.5			31.0
4		24	15.0			55.0
5		26	48.0		46	19.9
Mean	9	21	41.96	9	45	30.56
Rate			+ .13			+ .14
Aber.			- .11			- .02
bB			+2.04			+ .47
RA	9	21	44.02	9	45	31.05
	9	23	18.26	9	47	14.01
1st App.		+1	34.24		+1	42.96
cC			- 1.98			- .32
Cor.+aA		1	36.22		1	43.28
aA						+ .21
Slow				1	43.07	

Computations.

"c"			"c"		
Star.	Clamp West. 1st App.	C.	Star.	Clamp East. 1st App.	C.
	m.	s.		m.	s.
χ Aur.	+1 43.28	+1.18	ζ^1 Can.	+1 42.83	+1.05
α^2 Gem.	.28	1.18	η Can.	.83	1.07
β Gem.	.49	1.13	γ Can.	.78	1.08
			ι U. M.	.06	1.49
			μ Leo.	.96	1.11
Mean	1 43.35	+1.16		1 42.69	+1.16

$$c = \frac{(1^m 43^s.35) - (1^m 42^s.69)}{1.16 + 1.16}$$

$$c = +0.28 \quad \text{Clamp W.}$$

$$c = -0.28 \quad \text{Clamp E.}$$

"a"			"a"		
Star.	Clamp West. Cor.+aA.	A	Star.	Clamp East. Cor.+aA.	A
	m.	s.		m.	s.
χ Aur.	+1 42.94	+ 0.04	ζ^1 Can.	+1 43.13	+0.30
α^2 Gem.	42.94	+ .04	η Can.	43.13	+ .26
β Gem.	43.17	+ .12	γ Can.	43.09	+ .24
			ι U. M.	42.48	- .36
			μ Leo.	43.28	+ .16
Mean	1 43.02	+ .07	Mean	1 43.02	+ .12
51 Cep.	1 20.90	-16.32	1 Drac.	1 36.22	-5.13
Diff.	+22.12	+16.39	Diff.	+6.80	+5.25
	$a = \frac{+22.12}{16.39}$			$a = \frac{+6.80}{5.25}$	
	$a = + 1.35$			$a = +1.30$	

MARCH 5, 1902, MACCONNEL, RED RIVER—Continued.*Chronometer corrections.*

	m.	s.
χ Aurigae slow	1	42.89
α^2 Gemin. slow		42.89
β Gemin. slow		43.01
ζ^1 Cancr. slow		42.74
η Cancr. slow		42.79
γ Cancr. slow		42.78
ι Ursæ Maj. slow		42.95
μ Leonis slow		43.07

Mean slow 1 42.89 Epoch of exchange.

Exchange signals received at Red River.

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
6	3	1.40	6	6	51.20	6	3	39.50	6	7	29.50	
		3.50			53.30			41.48			31.34	
		5.48			55.32			43.50			33.32	
		7.50			57.40			45.50			35.40	
		9.50			59.48			47.50			37.38	
		11.50	7	1	40			49.50			39.35	
		13.50			3.47			51.50			41.35	
		15.50			5.43			53.50			43.34	
		17.50			7.30			55.50			45.37	
		19.50			9.36			57.53			47.30	
		21.50			11.27			59.45			49.38	
		23.43			13.36							
		25.50			15.40	Mean	6	3	30.49	6	7	20.38
		27.50			17.43	Chr. slow	+ 1	42.89	+ 1	42.89		
		29.47			19.39							
		31.50			21.42	Correct	6	5	13.38	6	9	3.27
		33.45			23.47	St. Louis	6	44	25.56	6	48	15.35
		35.46			25.42							
		37.45			27.43	Diff.	39	12.18	39	12.08		

Mean, 39^m 12^s.13, March 5, 1902, St. Louis to Red River.

MARCH 14, 1902, KIDDER, ST. LOUIS.*Levels.*

CLAMP WEST.

	W.	6 ^h 45 ^m	E.	W.	8 ^h 30 ^m	E.
Dir.	7.8		7.8	8.8		7.0
Rev.	9.9		5.9	10.5		5.3
Rev.	10.0		5.8	10.5		5.3
Dir.	8.8		7.0	8.8		7.0
Sum	36.5		26.5	38.6		24.6
Diff.		+10.0			+14.0	
$\frac{1}{8}$		1.25			1.75	
d		0°.136			0°.136	
b		.17			.24	

CLAMP EAST.

	W.	9 ^h 15 ^m	E.	W.	10 ^h 25 ^m	E.
Dir.	8.1		7.6	9.1		7.0
Rev.	10.0		5.7	9.7		6.8
Rev.	10.1		5.8	9.7		6.8
Dir.	9.0		7.0	9.5		7.0
Sum	37.2		26.1	38.0		27.6
Diff.		+11.1			+10.4	
$\frac{1}{8}$		1.388			1.3	
d		0°.136			0°.136	
b		.19			.18	

MARCH 14, 1902, KIDDER, ST. LOUIS—Continued.

Clamp West.

Star	51 Cephei, $\delta=87^{\circ} 12'$	δ Gemin., $\delta=22^{\circ} 10'$
Factors	A=-15.36 a=-.41 B=+13.56 b=+.18 C=+20.49 c=+.16	A=+0.30 a=-.41 B=+1.03 b=+.19 C=+1.08 c=+.16
Wires.	Chron. T. h. m. s.	Chron. T. h. m. s.
1		7 12 5.8
2	6 49 50.4	10.7
3	51 20.7	15.3
4	52 54.0	20.1
5	54 22.6	25.0
6	55 56.3	29.9
7		34.9
Mean	6 52 52.80	7 12 20.34
Rate	— .13	— .11
Aber.	— .34	— .02
δB	+2.44	+ .20
RA	6 52 54.77 6 55 2.34	7 12 20.41 7 14 18.30
1st App.	+2 7.57	+1 57.89
cC	+3.28	+ .17
Cor.+ αA	2 4.29	1 57.72 — .12
Slow		1 57.84
Star	α^2 Gemin., $\delta=32^{\circ} 6'$	β Gemin., $\delta=28^{\circ} 16'$
Factors	A=+0.12 a=-.41 B=+1.17 b=+.20 C=+1.18 c=+.16	A=+0.20 a=-.41 B=+1.12 b=+.21 C=+1.13 c=+.16
Wires.	Chron. T. h. m. s.	Chron. T. h. m. s.
1	Lost	7 37 7.8=23.1
2	"	13.1
3	"	18.0
4	7 26 24.6=24.6	23.1
5	30.0=24.8	28.2
6	35.7=25.2	33.1
7	40.6=24.7	Lost.
Mean	7 26 24.82	7 37 23.10
Rate	— .10	— .08
Aber.	— .02	— .02
δB	+ .23	+ .24
RA	7 26 24.93 7 28 23.10	7 37 23.24 7 39 21.41
1st App.	+1 58.17	+1 58.17
cC	+ .19	+ .18
Cor.+ αA	1 57.98 — .05	1 57.99 — .08
Slow	1 58.03	1 58.07

MARCH 14, 1902, KIDDER, ST. LOUIS—Continued.

Star	ζ =Cancer, $\delta=17^{\circ} 57'$			η Cancer, $\delta=20^{\circ} 46'$		
Factors	A=+0.37	a=−.41		A=+0.33	a=−.41	
	B=+0.98	b=+.22		B=+1.02	b=+.23	
	C=+1.05	c=+.16		C=+1.07	c=+.16	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	8	4	25.6	8	24	52.3
2			30.1			57.0
3			34.8	25		1.8
4			39.3			6.7
5			44.1			11.4
6			48.8			16.1
7			53.7			21.1
Mean	8	4	39.49	8	25	6.63
Rate			−.06			−.04
Aber.			−.02			−.02
bB			+.22			+.23
RA	8	4	39.63	8	25	6.80
	8	6	37.74	8	27	4.85
1st App.	+1		58.11	+1		58.05
cC			+.17			+.17
Cor.+aA	1		57.94	1		57.88
aA			−.15			−.14
Slow	1		58.09	1		58.02

Clamp East.

Star	1 Draconis, $\delta=81^{\circ} 46'$			ϵ Leonis, $\delta=24^{\circ} 14'$		
Factors	A=−4.77	a=−.41		A=+0.27	a=−.41	
	B=+5.09	b=+.19		B=+1.06	b=+.19	
	C=+6.98	c=−.16		C=+1.09	c=−.16	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	19	45.0	9	38	7.2
2			Lost.			12.2
3	20		47.3			17.1
4	21		18.0			22.1
5			49.3			26.9
6			Lost.			31.8
7	22		50.4			36.6
Mean	9	21	18.00	9	38	21.99
Rate			+.03			+.04
Aber.			−.11			−.02
bB			+.97			+.20
RA	9	21	18.89	9	38	22.21
	9	23	17.69	9	40	19.88
1st App.	+1		58.80	+1		57.67
cC			−1.12			−.17
Cor.+aA	1		59.92	1		57.84
aA						−.11
Slow				1		57.95

MARCH 14, 1902, KIDDER, ST. LOUIS—Continued.

Star	μ Leonis, $\delta=26^{\circ} 28'$			α Leonis, $\delta=12^{\circ} 27'$		
Factors	A=+0.23 a=-.41 B=+1.09 b=+.19 C=+1.11 c=-.16			A=+0.45 a=-.41 B=+0.92 b=+.18 C=+1.03 c=-.16		
Wires.	Chron. T.			Chron. T.		
1	h. m. s.			h. m. s.		
2	9 45	1.2		10 1	0.0	
3		6.2			4.8	
4		11.1			9.2	
5		16.1			13.9	
6		21.2			18.5	
7		26.0			23.5	
		31.1			27.5	
Mean	9 45	16.13		10 1	13.89	
Rate		+.05			+.06	
Aber.		-.02			-.02	
bB		+.21			+.16	
RA	9 45	16.37		10 1	14.09	
	9 47	13.97		10 3	11.68	
1st App.	+1	57.60		+1	57.59	
cC		-.18			-.16	
Cor.+aA	1	57.78		1	57.75	
aA		-.10			-.18	
Slow	1	57.88		1	57.93	
Star	λ Ursæ Maj., $\delta=43^{\circ} 24'$			β Leo. Min., $\delta=37^{\circ} 13'$		
Factors	A=-0.12 a=-.41 B=+1.37 b=+.18 C=+1.38 c=-.16			A=+0.02 a=-.41 B=+1.25 b=+.18 C=+1.25 c=-.16		
Wires.	Chron. T.			Chron. T.		
1	h. m. s.			h. m. s.		
2	10 8	57.5		10 20	0.7	
3	9	3.9			6.3	
4		9.8			12.0	
5		16.0			17.8	
6		22.1			23.3	
7		28.1			28.9	
		34.4			34.6	
Mean	10 9	15.97		10 20	17.66	
Rate		+.08			+.09	
Aber.		-.02			-.02	
bB		+.25			+.22	
RA	10 9	16.28		10 20	17.95	
	10 11	14.14		10 22	15.80	
1st App.	+1	57.86		+1	57.85	
cC		-.22			-.20	
Cor.+aA	1	58.08		1	58.05	
aA		+.05			-.01	
Slow	1	58.03		1	58.06	

MARCH 14, 1902, KIDDER, ST. LOUIS—Continued.

Computations.

"c"

Clamp West.			Clamp East.			
Star.	1st App.		C.	Star.	1st App.	
	m.	s.			m.	s.
δ Gem.	+1	57.89	+1.08	ε Leo.	+1	57.67
α^2 Gem.		58.17	1.18	μ Leo.		.60
β Gem.		58.17	1.13	α Leo.		.59
ζ^1 Can.		58.11	1.05	λ U. M.		.86
η Can.		58.05	1.07	β Leo. M.		.85
Mean	+1	58.08	+1.10	Mean	+1	57.71

$$c = \frac{(1^m 58^s.08) - (1^m 57^s.71)}{1.10 + 1.17}$$

$$c = +.16 \text{ Clamp West.}$$

$$c = -.16 \text{ Clamp East.}$$

"a"				"a"			
Star.	Clamp West.		A.	Star.	Clamp East.		A.
	Cor. +aA				Cor. +aA		
	m.	s.			m.	s.	
δ Gem.	+1	57.72	+ 0.30	ε Leo.	+1	57.84	+0.27
α^2 Gem.		.98	+ 0.12	μ Leo.		57.78	+0.23
β Gem.		.99	+ 0.20	α Leo.		57.75	+0.45
ζ^1 Can.		.94	+ 0.37	λ U. M.		58.08	-0.12
η Can.		.88	+ 0.28	β Leo M.		58.05	+0.02
<hr/>				<hr/>			
Mean	+1	57.90	+ 0.26	Mean	+1	57.90	+0.17
51 Cep.	+2	4.29	-15.36	1 Drac.	1	59.92	-4.77
<hr/>				<hr/>			
Diff.		-6.39	+15.62	Diff.		-2.02	+4.94

$$a = \frac{-6.39}{15.62}$$

$$a = -.41$$

$$a = \frac{-2.02}{4.94}$$

$$a = -.41$$

Chronometer corrections.

	m.	s.
δ Gemin. slow	1	57.84
α^2 Gemin. slow		58.03
β Gemin. slow		58.07
ζ^1 Cancr. slow		58.09
η Cancr. slow		58.02
ε Leonis slow		57.95
μ Leonis slow		57.88
α Leonis slow		57.93
λ Ursæ Maj. slow		58.03
β Leo. Min. slow		58.06
Mean slow	1	57.99
Chron. slow	1	57.98 at epoch of exchange.

Epoch 9^h 0^m.

MARCH 14, 1902, KIDDER, ST. LOUIS—Continued.*Exchange signals received at St. Louis.*

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
8	50	59.40	8	53	0.65	8	51	35.41	8	53	36.60	
	51	1.40			2.67			37.40			38.70	
		3.35			4.70			39.40			40.60	
		5.40			6.75			41.40			42.54	
		7.44			8.70			43.40			44.50	
		9.40			10.58			45.35			46.40	
		11.40			12.80			47.38			48.40	
		13.38			14.60			49.38			50.40	
		15.40			16.60			51.42			52.40	
		17.40			18.60			53.42			54.48	
		19.40			20.62			55.37			56.45	
		21.41			22.54			57.20			58.50	
		23.41			24.50							
		25.40			26.50	Mean	8	51	28.39	8	53	29.56
		27.40			28.54	Chr. slow	+ 1	57.98	+ 1	57.98		
		29.35			30.45							
		31.38			32.48	Correct	8	53	26.37	8	55	27.54
		33.40			34.55							

MARCH 14, 1902, MACCONNEL, RED RIVER.*Levels.***CLAMP WEST.**

	Dir.	6 ^h 30 ^m	Rev.	Dir.	8 ^h 10 ^m	Rev.
W.	50.4		21.0	51.5		18.9
E.	18.0		53.5	17.0		53.5
W.	51.5		20.6	53.2		18.5
E.	18.8		53.2	18.5		53.4
Sum	138.7		148.3	140.2		144.3
Diff.		-9.6			-4.1	
$\frac{1}{2}s$		1.2			0.51	
d		0°.111			0°.111	
b		-0.13			-.06	

CLAMP EAST.

	Dir.	9 ^h 10 ^m	Rev.	Dir.	10 ^h 25 ^m	Rev.
W.	54.0		17.3	54.0		15.0
E.	19.0		52.2	18.0		51.0
W.	53.0		17.0	55.1		15.3
E.	18.0		52.0	19.0		51.2
Sum	144.0		138.5	146.1		132.5
Diff.		+6.5			+13.6	
$\frac{1}{2}s$		.81			1.7	
d		0°.111			0°.111	
b		+0.09			+0.19	

MARCH 14, 1902, MACCONNEL, RED RIVER—Continued.

Clamp West.

Star	51 Cephi, $\delta=87^\circ 12'$						δ Gemin., $\delta=22^\circ 10'$					
Factors	A=-16.32 a=+.24 B=+12.38 b=-.12 C=+20.49 c= Cor.						A=+0.23 a=+.24 B=+1.05 b=-.10 C=+1.09 c=+.02					
Wires.	Chron. T.						Chron. T.					
	h. m. s.			h. m. s.			h. m. s.			h. m. s.		
1	6	38	19.2=	6	53	15.8	7	11	46.9			
2		45	41.3=			20.4		12	10.5			
3		53	24.1=			30.3			34.1			
4	7	1	8.1=			29.0			58.3			
5		8	28.2=			31.6		13	21.3			
Mean	6	53	24.20				7	12	34.22			
Rate			-.05						-.04			
Aber.			-.35						-.02			
bB			-1.48						-.10			
RA	6	53	22.32				7	12	34.06			
	6	55	2.34				7	14	18.30			
1st App.			+1 40.72						+1 44.26			
cC			0.00						+.02			
Cor.+aA			1 40.02						1 44.24			
aA	{ Wires 1 and 2 Cl. E. }								+.06			
Slow	{ Wires 3, 4, and 5 Cl. W. }								1 44.18			
Star	α^2 Gemin., $\delta=32^\circ 6'$						β Gemin., $\delta=28^\circ 16'$					
Factors	A=+0.04 a=+.24 B=+1.18 b=-.09 C=+1.18 c=+.02						A=+0.12 a=+.24 B=+1.13 b=-.08 C=+1.13 c=+.02					
Wires.	Chron. T.						Chron. T.					
	h. m. s.			h. m. s.			h. m. s.			h. m. s.		
1	7	25	47.4				7	36	49.6			
2		26	13.5					37	12.7			
3			38.9						37.0			
4		27	5.6					38	2.6			
5			31.4						27.1			
Mean	7	26	39.36				7	37	37.40			
Rate			-.03						-.02			
Aber.			-.02						-.02			
Bb			-.11						-.07			
RA	7	26	39.20				7	37	37.39			
	7	28	23.10				7	39	21.41			
1st App.			+1 43.90						+1 44.02			
cC			+.03						+.02			
Cor.+aA			1 43.87						1 44.00			
aA			+.01						+.03			
Slow			1 43.86						1 43.97			

MARCH 14, 1902, MACCONNEL, RED RIVER—Continued.

Star	ζ^1 Cancri, $\delta=17^\circ 57'$		
Factors	$A=+0.30$ $a=+.24$ $B=+1.04$ $b=-.07$ $C=+1.07$ $c=+.02$		
Wires.	Chron. T.		
	h.	m.	s.
1	8	4	7.6
2			30.9
3			53.6
4		5	17.2
5			39.9
Mean	8	4	53.84
Rate			— .00
Aber.			— .02
bB			— .07
RA	8	4	53.75
	8	6	37.74
1st App.	+1 43.99		
cC	+.02		
Cor.+aA	1 43.97		
aA	+.07		
Slow	1 43.90		

Clamp East.

Star	1 Draconis, $\delta=81^\circ 46'$			ϵ Leonis, $\delta=24^\circ 14'$		
Factors	$A=-5.13$ $a=-.03$ $B=+4.73$ $b=+.10$ $C=+6.98$ $c=-.02$			$A=+0.20$ $a=-.03$ $B=+1.09$ $b=+.11$ $C=+1.10$ $c=-.02$		
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	16	28.0	9	37	47.7
2		18	57.3		38	11.2
3		21	35.3			35.9
4		24	6.4			59.6
5		26	39.3		39	23.8
Mean	9	21	33.26	9	38	35.64
Rate			+.05			+.06
Aber.			— .11			— .02
bB			+.47			+.12
RA	9	21	33.67	9	38	35.80
	9	23	17.69	9	40	19.88
1st App.	+1 44.02			+1 44.08		
cC	— .14			— .02		
Cor.+aA	1 44.16			1 44.10		
aA				— .01		
Slow				1 44.11		

MARCH 14, 1902, MACCONNEL, RED RIVER—Continued.

 μ Leonis, $\delta=26^\circ 28'$

Factors	A=+0.16	a=— .03
	B=+1.10	b=+ .12
	C=+1.11	c=— .02

Wires.	Chron. T.		
	h.	m.	s.
1	9	44	40.9
2		45	4.7
3			30.0
4			54.0
5		46	18.7
Mean	9	45	29.66
Rate			+ .06
Aber.			— .02
δB			+ .13
RA	9	45	29.83
	9	47	13.97
1st App.		+1	44.14
cC			— .02
Cor.+aA		1	44.16
aA			.00
Slow		1	44.16

 α Leonis, $\delta=12^\circ 27'$

A=+0.38	a=— .03
B=+1.03	b=+ .14
C=+1.04	c=— .02

Wires.	Chron. T.		
	h.	m.	s.
10	0		42.8
1			4.7
			27.7
			50.0
2			12.5
Mean	10	1	27.54
Rate			+ .08
Aber.			— .02
δB			+ .14
RA	10	1	27.74
	10	3	11.68
1st App.		+1	43.94
cC			— .02
Cor.+aA		1	43.96
aA			— .01
Slow		1	43.97

 λ Ursæ Maj., $\delta=43^\circ 24'$

Factors	A=—0.22	a=— .03
	B=+1.36	b=+ .15
	C=+1.38	c=— .02

Wires.	Chron. T.		
	h.	m.	s.
1	10	8	29.8
2			59.2
3		9	30.6
4		10	0.0
5			30.2
Mean	10	9	29.96
Rate			+ .08
Aber.			— .02
δB			+ .20
RA	10	9	30.22
	10	11	14.14
1st App.		+1	43.92
cC			— .03
Cor.+aA		1	43.95
aA			+ .01
Slow		1	43.94

 β Leo. Min., $\delta=37^\circ 13'$

A=—0.06	a=— .03
B=+1.25	b=+ .16
C=+1.25	c=— .02

Wires.	Chron. T.		
	h.	m.	s.
10	19		37.1
20			3.8
			31.9
			59.0
21			26.5
Mean	10	20	31.66
Rate			+ .09
Aber.			— .02
δB			+ .20
RA	10	20	31.93
	10	22	15.80
1st App.		+1	43.87
cC			— .03
Cor.+aA		1	43.90
aA			.00
Slow		1	43.90

MARCH 14, 1902, MACCONNEL, RED RIVER—Continued.

Computations.

"c"

Star.	Clamp West. 1st App.		C.	Star.	Clamp East. 1st App.		C.
	m.	s.			m.	s.	
δ Gem.	+1	44.26	+1.09	ε Leo.	+1	44.08	+1.10
α^2 Gem.		43.90	1.18	μ Leo.		44.14	1.11
β Gem.		44.02	1.13	α Leo.		43.94	1.04
ζ^1 Cancr.		43.99	1.07	λ U. M.		43.92	1.38
				β L. M.		43.87	1.25
Mean	+1	44.04	+1.12	Mean	+1	43.99	+1.18

$$c = \frac{(1^m 44^s.04) - (1^m 43^s.99)}{1.12 + 1.18}$$

c = +0.02 Clamp West.

c = -0.02 Clamp East.

"a"

Star.	Clamp West. Cor. + aA.		A.
	m.	s.	
δ Gem.	+1	44.24	+ .23
α^2 Gem.		43.87	+ .04
β Gem.		44.00	+ .12
ζ^1 Can.		43.97	+ .30
Mean	+1	44.02	+ .17
51 Cep.	1	40.02	-16.32
Diff.	+ 4.00		+16.49

$$a = \frac{4.00}{16.49}$$

$$a = +0.24$$

"a"

Star.	Clamp East. Cor. + aA.		A.
	m.	s.	
ε Leo.	+1	44.10	+ .20
μ Leo.		44.16	+ .16
α Leo.		43.96	+ .38
λ U. M.		43.95	- .22
β L. M.		43.90	- .06
Mean	+1	44.02	+ .09
1 Drac.	+1	44.16	-5.13
Diff.	- 0.14		+5.22

$$a = \frac{-0.14}{5.22}$$

$$a = -0.03$$

Chronometer corrections.

	m.	s.
δ Gemin. slow	1	44.18
α^2 Gemin. slow		43.86
β Gemin. slow		43.97
ζ^1 Cancr. slow		43.90
ε Leonis slow		44.11
μ Leonis slow		44.16
α Leonis slow		43.97
λ Ursæ Maj. slow		43.94
β Leo. Min. slow		43.90

Mean slow 1 44.00 Epoch of exchange.

THE ONE HUNDREDTH MERIDIAN.

MARCH 14, 1902, MACCONNEL, RED RIVER—Continued.

Exchange signals received at Red River.

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
8	12	1.50	8	14	2.85	8	12	39.50	8	14	40.90	
		3.45			4.90			41.48			42.81	
		5.42			6.88			43.48			44.76	
		7.50			8.95			45.50			46.73	
		9.50			10.92			47.45			48.60	
		11.50			12.80			49.48			50.65	
		13.50			14.98			51.48			52.62	
		15.48			16.85			53.50			54.65	
		17.48			18.80			55.50			56.70	
		19.48			20.80			57.48			58.68	
		21.48			22.83			59.30			60.70	
		23.50			24.76							
		25.50			26.70	Mean	8	12	30.47	8	14	31.77
		27.50			28.70	Chr. slow	+ 1	44.00	+ 1	44.00		
		29.45			30.73							
		31.45			32.65	Correct	8	14	14.47	8	16	15.77
		33.47			34.70	St. Louis	8	53	26.37	8	55	27.54
		35.50			36.78							
		37.50			38.82	Diff.	39	11.90	39	11.77		

Mean 39^m 11^s.835, March 14, 1902, St. Louis to Red River.

MARCH 16, 1902, KIDDER, ST. LOUIS.

Levels.

CLAMP WEST.

	6 ^h 35 ^m			8 ^h 10 ^m	
	W.	E.		W.	E.
Dir.	9.7	6.1		10.4	6.3
Rev.	10.8	5.0		11.8	5.0
Rev.	11.0	4.8		11.8	5.0
Dir.	9.9	6.1		11.0	5.8
Sum	41.4	22.0		45.0	22.1
Diff.	+19.4			+22.9	
$\frac{1}{s}$	2.425			2.862	
d	0 ^s .136			0 ^s .136	
b	+ 0.33			+ 0.39	

CLAMP EAST.

	9 ^h 10 ^m			10 ^h 25 ^m	
	W.	E.		W.	E.
Dir.	10.7	6.3		12.6	5.4
Rev.	11.7	5.2		10.9	7.1
Rev.	11.8	5.2		11.0	7.0
Dir.	11.9	5.3		12.5	5.9
Sum	46.1	22.0		47.0	25.4
Diff.	+24.1			+21.6	
$\frac{1}{s}$	3.01			2.7	
d	0 ^s .136			0 ^s .136	
b	+ 0.41			+ 0.37	

MARCH 16, 1902, KIDDER, ST. LOUIS—Continued.

Clamp West.

Star	51 Cephei, $\delta=87^{\circ} 12'$			δ Gemin., $\delta=22^{\circ} 10'$		
Factors	A=-15.36	a=-.16		A=+0.30	a=-.16	
	B=+13.56	b=+.34		B=+1.03	b=+.35	
	C=+20.49	c=+.246		C=+1.08	c=+.246	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	6	48	12.9	7	12	3.0
2		49	49.4			8.0
3		51	18.4			12.6
4		52	48.7			17.3
5		54	21.2			22.2
6		55	50.6			27.1
7		57	26.3			32.0
Mean	6	52	49.64	7	12	17.46
Rate			-.13			-.11
Aber.			-.34			-.02
bB			+4.61			+3.36
RA	6	52	53.78	7	12	17.69
	6	55	1.59	7	14	18.27
1st App.		+2	7.81		+2	0.58
cC			+5.04			+2.26
Cor.+aA		2	2.77		2	0.32
aA						-.05
Slow					2	0.37
Star	α^2 Gemin., $\delta=32^{\circ} 8'$			β Gemin., $\delta=28^{\circ} 16'$		
Factors	A=+0.12	a=-.16		A=+0.20	a=-.16	
	B=+1.17	b=+.36		B=+1.12	b=+.37	
	C=+1.18	c=+.246		C=+1.13	c=+.246	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	7	26	6.5	7	37	5.1
2			11.9			10.6
3			16.8			15.2
4			22.0			20.4
5			27.3			25.4
6			32.6			30.3
7			37.9			35.8
Mean	7	26	22.14	7	37	20.40
Rate			-.10			-.08
Aber.			-.02			-.02
bB			+4.42			+4.41
RA	7	26	22.44	7	37	20.71
	7	28	23.07	7	39	21.38
1st App.		+2	0.63		+2	0.67
cC			+2.29			+2.28
Cor.+aA		2	0.34		2	0.39
aA			-.02			-.03
Slow		2	0.36		2	0.42

MARCH 16, 1902, KIDDER, ST. LOUIS—Continued.

Star	26 Lyncis, $\delta=47^{\circ} 49'$			ζ^1 Cancri, $\delta=17^{\circ} 57'$		
Factors	A=-0.23	a=-.16		A=+0.37	a=-.16	
	B=+1.47	b=+.38		B=+0.98	a=+.39	
	C=+1.49	c=+.246		C=+1.05	c=+.246	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	7	45	16.1	8	4	22.6
2			23.0			27.6
3			29.7			32.0
4			35.7			36.9
5			42.7			41.6
6			49.7			46.3
7			56.2			50.8
Mean	7	45	36.16	8	4	36.83
Rate			-.08			-.06
Aber.			-.03			-.02
δB			+.54			+.37
RA	7	45	36.59	8	4	37.12
	7	47	37.38	8	6	37.72
1st App.	+2	0.79		+2	0.60	
cC		+.37			+.26	
Cor. + αA	2	0.42		2	0.34	
αA		+.04			-.06	
Slow	2	0.38		2	0.40	

Clamp East.

Star	1 Draconis, $\delta=81^{\circ} 46'$			ϵ Leonis, $\delta=24^{\circ} 14'$		
Factors	A=-4.77	a=-.23		A=+0.27	a=-.23	
	B=+5.09	b=+.41		B=+1.06	b=+.40	
	C=+6.98	c=-.246		C=+1.09	c=-.246	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	19	42.2	9	38	4.5
2		20	13.2			9.7
3			45.1			14.5
4		21	16.1			19.3
5			46.4			24.3
6		22	17.3			29.4
7			49.8			34.2
Mean	9	21	15.73	9	38	19.41
Rate			+.03			+.04
Aber.			-.11			-.02
δB			+2.09			+.42
RA	9	21	17.74	9	38	19.85
	9	23	17.53	9	40	19.86
1st App.	+1	59.79		+2	0.01	
cC		-1.72			-.27	
Cor. + αA	2	1.51		2	0.28	
αA					-.06	
Slow				2	0.34	

MARCH 16, 1902, KIDDER, ST. LOUIS—Continued.

Star	μ Leonis, $\delta=26^{\circ} 28'$			α Leonis, $\delta=12^{\circ} 27'$		
Factors	A=+ .23	a=— .23		A=+0.45	a=— .23	
	B=+1.09	b=+ .39		B=+0.92	b=+ .38	
	C=+1.11	c=— .246		C=+1.03	c=— .246	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	44	58.5	10	0	57.4
2		45	3.6		1	1.9
3			8.5			6.8
4			13.3			11.3
5			18.8			15.7
6			23.6			20.1
7			28.6			24.8
Mean	9	45	13.56	10	1	11.24
Rate			+ .05			+ .06
Aber.			— .02			— .02
bB			+ .42			+ .35
RA	9	45	14.01	10	1	11.63
	9	47	13.95	10	3	11.66
1st App.	+ 1	59.94		+ 2	.03	
cC		— .27			— .25	
Cor. + aA	2	.21		2	.28	
aA		— .05			— .10	
Slow	2	.26		2	.38	
Star	λ Ursæ Maj., $\delta=43^{\circ} 24'$			β Leo. Min., $\delta=37^{\circ} 13'$		
Factors	A=— .12	a=— .23		A=+ .02	a=— .23	
	B=+1.37	b=+ .38		B=+1.25	b=+ .37	
	C=+1.38	c=— .246		C=+1.25	c=— .246	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	10	8	55.0	10	19	58.5
2		9	1.2		20	3.9
3			7.4			9.2
4			13.6			14.9
5			19.5			20.6
6			25.3			26.1
7			31.8			31.9
Mean	10	9	13.40	10	20	15.01
Rate			+ .08			+ .09
Aber.			— .02			— .02
bB			+ .52			+ .46
RA	10	9	13.98	10	20	15.54
	10	11	14.12	10	22	15.78
1st App.	+ 2	.14		+ 2	.24	
cC		— .34			— .31	
Cor. + aA	2	0.48		2	0.53	
aA		+ .03			.00	
Slow	2	0.45		2	0.55	

MARCH 16, 1902, KIDDER, ST. LOUIS—Continued.

Computations.

"c"

Star.	Clamp West. 1st App.		C.	Star.	Clamp East. 1st App.		C.
	m.	s.			m.	s.	
δ Gem.	+2	0.58	+1.08	ε Leo.	+2	0.01	+1.09
α^2 Gem.		.63	1.18	μ Leo.	1	59.94	1.11
β Gem.		.67	1.13	α Leo.	2	0.03	1.03
26 Lyn.		.79	1.49	λ U. M.		.14	1.38
ζ^1 Can.		.60	1.05	β L. M.		.24	1.25
Mean	2	0.65	+1.19	Mean	+2	0.07	+1.17

$$c = \frac{(2^m \ 0^s.65) - (2^m \ 0^s.07)}{1.19 + 1.17}$$

c = +0.246 for Clamp West.

c = -0.246 for Clamp East.

Star.	"a" Clamp West. Cor. + aA		A.	Star.	"a" Clamp East. Cor. + aA		A.
	m.	s.			m.	s.	
δ Gem.	+2	0.32	+ 0.30	ε Leo.	+2	0.28	+0.27
α^2 Gem.		.34	+ .12	μ Leo.		.21	+ .23
β Gem.		.39	+ .20	α Leo.		.28	+ .45
26 Lyn.		.42	- .23	λ U. M.		.48	- .12
ζ^1 Can.		.34	+ .37	β L. M.		.55	+ .02
Mean	+2	0.36	+ 0.15	Mean	+2	0.36	+0.17
51 Cep.	+2	2.77	-15.36	1 Drac.	+2	1.51	-4.77
Diff.	-	2.41	+15.51	Diff.	-	1.15	+4.94

$$a = \frac{-2.41}{15.51}$$

$$a = -0.16$$

$$a = \frac{-1.15}{4.94}$$

$$a = -0.23$$

Chronometer corrections.

	m.	s.
δ Gemin. slow	+2	0.37
α^2 Gemin. slow		.36
β Gemin. slow		.42
26 Lyncis slow		.38
ζ^1 Cancr. slow		.40
ε Leonis slow		.34
μ Leonis slow		.26
α Leonis slow		.38
λ Ursæ Maj. slow		.45
β Leo. Min. slow		.55

Mean slow +2 0.39 Epoch 9^h 0^m.
 slow 2^m 0^s.38 Epoch of exchange.

MARCH 16, 1902, KIDDER, ST. LOUIS—Continued.*Exchange signals received at St. Louis.*

From Red River.			From St. Louis.			From Red River.			From St. Louis.		
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.
8	48	57.65	8	51	0.64	8	49	33.65	8	51	36.50
		59.65			2.65			35.65			38.45
	49	1.65			4.70			37.60			40.44
		3.65			6.55			39.60			42.36
		5.68			8.60			41.64			44.45
		7.65			10.60			43.60			46.32
		9.60			12.63			45.62			48.30
		11.60			14.62			47.60			50.30
		13.62			16.58			49.60			52.40
		15.61			18.54			51.60			54.36
		17.60			20.50			53.60			56.40
		19.60			22.48			55.60			58.38
		21.65			24.55						
		23.65			26.52	Mean	8 49 26 63		8 51 29 50		
		25.64			28.50	Chr. slow	+ 2 0.38		+ 2 0.38		
		27.64			30.53						
		29.62			32.50	Correct	8 51 27.01		8 53 29.88		
		31.61			34.53						

MARCH 16, 1902, MACCONNEL, RED RIVER.*Levels.*

CLAMP WEST.

	6 ^h 30 ^m		8 ^h 20 ^m	
	Dir.	Rev.	Dir.	Rev.
W.	47.1	14.2	51.0	12.5
E.	8.0	53.5	9.4	54.0
W.	47.7	14.8	51.5	8.8
E.	8.3	54.0	9.8	53.0
Sum	111.1	136.5	121.7	128.3
Diff.	-25.4		-6.6	
$\frac{1}{8}$	3.18		0.82	
d	0°.111		0°.111	
b	-0.35		-0.09	

CLAMP EAST.

	9 ^h 0 ^m		10 ^h 27 ^m	
	Dir.	Rev.	Dir.	Rev.
W.	47.0	15.1	48.5	13.6
E.	15.0	47.3	15.6	46.4
W.	47.1	15.0	49.0	13.7
E.	15.0	47.1	16.0	46.5
Sum	124.1	122.5	129.1	120.2
Diff.	+1.6		+8.9	
$\frac{1}{8}$	.2		1.11	
d	0°.111		0°.111	
b	+0.02		+0.12	

MARCH 16, 1902, MACCONNEL, RED RIVER—Continued.

Clamp West.

Star	51 Cephei, $\delta=87^{\circ} 12'$	δ Gemin., $\delta=22^{\circ} 10'$
Factors	$A=-16.32$ $a=-.48$ $B=+12.38$ $b=-.35$ $C=+20.49$ $c=+.10$ (Corrected.)	$A=+0.23$ $a=-.48$ $B=+1.05$ $b=-.30$ $C=+1.09$ $c=+.10$
Wires.	Chron. T.	Chron. T.
	h. m. s. h. m. s.	h. m. s.
1	8 38 18.0=6 53 14.6	7 11 46.5
2	45 38.7=6 53 17.8	12 10.3
3		33.6
4	7 0 51.9=6 53 12.8	57.7
5	8 7.1=6 53 10.5	13 21.3
Mean	6 53 13.90	7 12 33.84
Rate	— .05	— .04
Aber.	— .35	— .02
δB	— 4.33	— .32
RA	6 53 9.17	7 12 33.46
	6 55 1.59	7 14 18.27
1st App.	+1 52.42	+1 44.81
cC	0.00	+ .11
Cor. + aA	1 52.42	1 44.70
aA	(Wires 1 and 2, Cl. E.)	— .11
Slow	(Wires 4 and 5, Cl. W.)	1 44.81
Star	α^2 Gemin., $\delta=32^{\circ} 6'$	β Gemin., $\delta=28^{\circ} 16'$
Factors	$A=+0.04$ $a=-.48$ $B=+1.18$ $b=-.25$ $C=+1.18$ $c=+.10$	$A=+0.12$ $a=-.48$ $B=+1.13$ $b=-.20$ $C=+1.13$ $c=+.10$
Wires.	Chron. T.	Chron. T.
	h. m. s.	h. m. s.
1	7 25 47.0	7 36 49.0
2	26 12.8	37 12.2
3	38.1	36.5
4	27 5.0	38 2.5
5	30.1	26.9
Mean	7 26 38.60	7 37 37.02
Rate	— .03	— .02
Aber.	— .02	— .02
δB	— .30	— .23
RA	7 26 38.25	7 37 36.75
	7 28 23.07	7 39 21.38
1st App.	+1 44.82	+1 44.63
cC	+ .11	+ .11
Cor. + aA	1 44.71	1 44.52
aA	— .02	— .06
Slow	1 44.73	1 44.58

MARCH 16, 1902, MACCONNEL, RED RIVER—Continued.

Star	26 Lyncis, $\delta = 47^\circ 49'$			ζ' Cancri, $\delta = 17^\circ 57'$		
Factors	A = -0.35 a = -.48 B = +1.45 b = -.15 C = +1.48 c = +.10			A = +0.30 a = -.48 B = +1.04 b = -.10 C = +1.07 c = +.10		
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	7	44	47.7	8	4	7.1
2		45	20.2			30.3
3			52.6			53.0
4		46	26.2	5		16.6
5			57.7			39.2
Mean	7	45	52.88	8	4	53.24
Rate			-.02			-.00
Aber.			-.03			-.02
δB			-.22			-.10
RA	7	45	52.61	8	4	53.12
	7	47	37.38	8	6	37.72
1st App.	+1	44.77		+1	44.60	
cC		+.14			+.10	
Cor. + aA	1	44.63		1	44.50	
aA		+.17			-.14	
Slow	1	44.46		1	44.64	

Clamp East.

Star	1. Draconis, $\delta = 81^\circ 46'$			ϵ Leonis, $\delta = 24^\circ 14'$		
Factors	A = -5.13 a = -.48 B = +4.73 b = +.02 C = +6.98 c = -.10			A = +0.20 a = -.48 B = +1.09 b = +.04 C = +1.10 c = -.10		
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	16	26.1	9	37	47.2
2		18	55.5		38	11.0
3		21	33.4			35.6
4		24	3.4			58.9
5		26	37.0		39	23.4
Mean	9	21	31.08	9	38	35.22
Rate			+.05			+.06
Aber.			-.11			-.02
δB			+.09			+.04
RA	9	21	31.11	9	38	35.30
	9	23	17.53	9	40	19.86
1st App.	+1	46.42		+1	44.56	
cC		-.68			-.11	
Cor. + aA	1	47.10		1	44.67	
aA					-.10	
Slow				1	44.77	

MARCH 16, 1902, MACCONNEL, RED RIVER—Continued.

Star.	μ Leonis, $\delta=26^\circ 28'$				α Leonis, $\delta=12^\circ 27'$			
Factors	A=+0.16		a=— .48		A=+0.38		a=— .48	
	B=+1.10		b=+ .06		B=+1.03		b=+ .07	
	C=+1.11		c=— .10		C=+1.04		c=— .10	
Wires.	Chron. T.				Chron. T.			
	h.	m.	s.		h.	m.	s.	
1	9	44	40.6		10	0	42.1	
2		45	4.6			1	4.3	
3			29.8				27.4	
4			53.9				49.4	
5		46	18.4			2	11.8	
Mean	9	45	29.46		10	1	27.00	
Rate			+.06				+.08	
Aber.			— .02				— .02	
bB			+.07				+.07	
RA	9	45	29.57		10	1	27.13	
	9	47	13.95		10	3	11.66	
1st App.		+1	44.38			+1	44.53	
cC			— .11				— .10	
Cor.+aA		1	44.49			1	44.63	
aA			— .08				— .18	
Slow		1	44.57			1	44.81	
Star.	λ Ursæ Maj., $\delta=43^\circ 24'$				β Leo. Min., $\delta=37^\circ 13'$			
Factors	A=—0.22		a=— .48		A=—0.06		a=— .48	
	B=+1.36		b=+ .09		B=+1.25		b=+ .11	
	C=+1.38		c=— .10		C=+1.25		c=— .10	
Wires.	Chron. T.				Chron. T.			
	h.	m.	s.		h.	m.	s.	
1	10	8	29.2		10	19	36.0	
2			58.6			20	3.3	
3		9	29.8				31.7	
4			59.6				58.5	
5		10	29.7			21	26.1	
Mean	10	9	29.38		10	20	31.12	
Rate			+.08				+.09	
Aber.			— .02				— .02	
bB			+.12				+.14	
RA	10	9	29.56		10	20	31.33	
	10	11	14.12		10	22	15.78	
1st App.		+1	44.56			+1	44.45	
cC			— .13				— .12	
Cor.+aA		1	44.69			1	44.57	
aA			+.10				+.03	
Slow		1	44.59			1	44.54	

MARCH 16, 1902, MACCONNEL, RED RIVER—Continued.

Computations.

"c"					
Star.	Clamp West. 1st App.	C.	Star.	Clamp East. 1st App.	C.
	m. s.			m. s.	
δ Gem.	+1 44.81	+1.09	ε Leo.	+1 44.56	+1.10
α^2 Gem.	.82	1.18	μ Leo.	.38	1.11
β Gem.	.63	1.13	α Leo.	.53	1.04
26 Lyn.	.77	1.48	λ U. M.	.56	1.38
ζ^1 Can.	.60	1.07	β L. M.	.45	1.25
Mean	+1 44.73	+1.19	Mean.	+1 44.50	+1.18

$$c = \frac{(1^m 44^s.73) - (1^m 44^s.50)}{1.19 + 1.18}$$

$$c = +0.10 \text{ Clamp W.}$$

$$c = -0.10 \text{ Clamp E.}$$

"a"					
Star.	Clamp West. Cor. +aA.	A.	Star.	Clamp East. Cor. +aA.	A.
	m. s.			m. s.	
δ Gem.	+1 44.70	+ 0.23	ε Leo.	+1 44.67	+0.20
α^2 Gem.	.71	+ 0.04	μ Leo.	.49	+0.16
β Gem.	.52	+ 0.12	α Leo.	.63	+0.38
26 Lyn.	.63	- 0.35	λ U. M.	.69	-0.22
ζ^1 Can.	.50	+ 0.30	β L. M.	.57	-0.06
Mean	+1 44.61	+ 0.07	Mean.	+1 44.61	+0.09
51 Cep.	+1 52.42	-16.32	1 Drac.	+1 47.10	-5.13
Diff.	- 7.81	+16.39	Diff.	- 2.49	+5.22

$$a = \frac{-7.81}{16.39}$$

$$a = -0.48$$

$$a = \frac{-2.49}{5.22}$$

$$a = -0.48$$

Chronometer corrections.

	m. s.
δ Gemin. slow	1 44.81
α^2 Gemin. slow	.73
β Gemin. slow	.58
26 Lyncis slow	.46
ζ^1 Cancr. slow	.64
ε Leonis slow	.77
μ Leonis slow	.57
α Leonis slow	.81
λ Ursæ Maj. slow	.59
β Leo. Min. slow	.54

Mean 1 44.65 Epoch of exchange.

MARCH 16, 1902, MACCONNEL, RED RIVER—Continued.*Exchange signals received at Red River.*

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.		h.	m.	s.	h.	m.	s.
8	10	1.50	8	12	4.57		8	10	39.50	8	12	42.40
		3.50			6.60				41.44			44.40
		5.50			8.64				43.43			46.34
		7.48			10.50				45.45			48.40
		9.49			12.54				47.46			50.23
		11.48			14.54				49.46			52.29
		13.47			16.60				51.43			54.27
		15.42			18.57				53.44			56.35
		17.47			20.50				55.44			58.31
		19.48			22.50				57.45			60.35
		21.42			24.43				59.45			62.33
		23.50			26.42							
		25.50			28.50	Mean	8	10	30.47	8	12	33.45
		27.47			30.50	Chr. slow	+ 1	44.65		+ 1	44.65	
		29.48			32.50							
		31.45			34.50	Correct	8	12	15.12	8	14	18.10
		33.45			36.47	St. Louis	8	51	27.01	8	53	29.88
		35.47			38.50							
		37.50			40.46	Diff.		39	11.89		39	11.78

Mean 39^m 11^s.835, St. Louis to Red River, March 16, 1902.**MARCH 17, 1902, KIDDER, ST. LOUIS.***Levels.*

CLAMP WEST.

	W.	6 ^h 35 ^m	E.	W.	8 ^h 10 ^m	E.
Dir.	13.1		4.8	15.0		4.0
Rev.	12.0		5.9	11.9		7.0
Rev.	12.0		6.0	11.9		7.0
Dir.	13.0		5.0	15.0		4.0
Sum	50.1		21.7	53.8		22.0
Diff.		+28.4			+31.8	
$\frac{1}{s}$		3.55			3.975	
d		0 ^s .136			0 ^s .136	
b		+ 0.48			+ 0.54	

CLAMP EAST.

	W.	9 ^h 15 ^m	E.	W.	10 ^h 25 ^m	E.
Dir.	14.0		5.0	13.9		5.8
Rev.	12.8		6.3	12.3		7.2
Rev.	12.8		6.3	12.4		7.0
Dir.	14.0		5.0	13.9		5.6
Sum	53.6		22.6	52.5		25.6
Diff.		+31.0			+26.9	
$\frac{1}{s}$		3.875			3.36	
d		0 ^s .136			0 ^s .136	
b		+ 0.53			+ 0.46	

MARCH 17, 1902, KIDDER, ST. LOUIS—Continued.

Clamp West.

Star	51 Cephei, $\delta=87^{\circ} 12'$	δ Gemin., $\delta=22^{\circ} 10'$
Factors	A=-15.36 a=-.25 B=+13.56 b=+.48 C=+20.49 c=+.21	A=+0.30 a=-.25 B=+1.03 b=+.49 C=+1.08 c=+.21
Wires.	Chron. T. h. m. s.	Chron. T. h. m. s.
1	6 48 9.8	7 12 1.8
2	49 41.6	6.4
3	51 14.3	11.2
4	52 46.6	16.0
5	54 17.7	20.7
6	55 48.4	25.7
7	57 19.1	30.7
Mean	6 52 45.36	7 12 16.07
Rate	— .13	— .11
Aber.	— .34	— .02
bB	+6.50	+ .50
RA	6 52 51.39 6 55 1.23	7 12 16.44 7 14 18.25
1st App. cC	+2 9.84 + 4.26	+2 1.81 + .23
Cor.+aA aA	2 5.58	2 1.58 — .06
Slow		2 1.66
Star	α^2 Gemin., $\delta=32^{\circ} 6'$	β Gemin., $\delta=28^{\circ} 16'$
Factors	A=+0.12 a=-.25 B=+1.17 b=+.50 C=+1.18 c=+.21	A=+0.20 a=-.25 B=+1.12 b=+.51 C=+1.13 c=+.21
Wires.	Chron. T. h. m. s.	Chron. T. h. m. s.
1	7 26 4.9	7 37 3.8
2	9.9	9.0
3	15.3	14.0
4	20.4	19.3
5	25.4	24.1
6	31.2	29.0
7	36.6	34.2
Mean	7 26 20.53	7 37 19.06
Rate	— .10	— .08
Aber.	— .02	— .02
bB	+ .58	+ .61
RA	7 26 20.99 7 28 23.05	7 37 19.57 7 39 21.36
1st App. cC	+2 2.06 + .25	+2 1.79 + .23
Cor.+aA aA	2 1.81 — .03	2 1.56 — .05
Slow	2 1.84	2 1.61

MARCH 17, 1902, KIDDER, ST. LOUIS—Continued.

Star	26 Lyncis, $\delta=47^{\circ} 49'$			ζ^1 Cancri, $\delta=17^{\circ} 57'$		
Factors	A	=-0.23	a	=-.25	A	=+0.37
	B	=+1.47	b	=+.52	B	=+0.98
	C	=+1.49	c	=+.21	C	=+1.05
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	7	45	15.1	8	4	21.3
2			21.4			26.0
3			27.8			30.7
4			34.3			35.5
5			41.4			39.9
6			47.8			44.9
7			54.5			49.8
Mean	7	45	34.61	8	4	35.44
Rate			-.08			-.06
Aber.			-.03			-.02
bB			+.76			+.52
Rate	7	45	35.26	8	4	35.88
	7	47	37.35	8	6	37.70
1st App.	+2		2.09	+2		1.82
cC			+.31			+.22
Cor.+aA	2		1.78	2		1.60
aA			+.06			-.09
Slow	2		1.72	2		1.69

Clamp East.

Star	1 Drac., $\delta=81^{\circ} 46'$			ϵ Leonis, $\delta=24^{\circ} 14'$		
Factors	A	=-4.77	a	=-.37	A	=+0.27
	B	=+5.09	b	=+.52	B	=+1.06
	C	=+6.98	c	=-.21	C	=+1.09
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	19	39.0	9	38	3.3
2		20	8.7			8.4
3			41.8			13.0
4		21	13.1			17.9
5			44.5			23.0
6		22	16.5			27.7
7			46.0			32.7
Mean	9	21	12.80	9	38	18.00
Rate			-.03			+.04
Aber.			-.11			-.02
bB			+2.64			+.54
RA	9	21	15.36	9	38	18.56
	9	23	17.44	9	40	19.85
1st App.	+2		2.08	+2		1.29
cC			-1.45			-.23
Cor.+aA	2		3.53	2		1.52
aA						-.10
Slow				2		1.62

THE ONE HUNDREDTH MERIDIAN.

47

MARCH 17, 1902, KIDDER, ST. LOUIS—Continued.

Star μ Leonis, $\delta=26^{\circ} 28'$ α Leonis, $\delta=12^{\circ} 27'$

Factors	A=+0.23	a=— .37	A=+0.45	a=— .37
	B=+1.09	b=+ .50	B=+0.92	b=+ .49
	C=+1.11	c=— .21	C=+1.03	c=— .21

Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	44	56.9	10	0	56.0
2		45	1.7		1	1.1
3			6.9			5.3
4			11.8			9.9
5			16.8			14.4
6			22.0			18.9
7			27.1			23.3
Mean	9	45	11.89	10	1	9.84
Rate			+ .05			+ .06
Aber.			— .02			— .02
bB			+ .54			+ .45
RA	9	45	12.46	10	1	10.33
	9	47	13.95	10	3	11.66
1st App.			+2 1.49			+2 1.33
cC			— .23			— .21
Cor.+aA			2 1.72			2 1.54
aA			— .08			— .16
Slow			2 1.80			2 1.70

Star λ Ursæ Maj., $\delta=43^{\circ} 24'$ β Leo. Min., $\delta=37^{\circ} 13'$

Factors	A=—0.12	a=— .37	A=+0.02	a=— .37
	B=+1.37	b=+ .48	B=+1.25	b=+ .47
	C=+1.38	c=— .21	C=+1.25	c=— .21

Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	10	8	53.6	10	19	56.5
2			59.2		20	2.2
3		9	5.9			8.4
4			12.1			13.7
5			18.0			19.3
6			24.1			25.1
7			30.5			30.5
Mean	10	9	11.94	10	20	13.67
Rate			+ .08			+ .09
Aber.			— .02			— .02
bB			+ .66			+ .59
RA	10	9	12.66	10	20	14.33
	10	11	14.12	10	22	15.78
1st App.			+2 1.46			+2 1.45
cC			— .29			— .26
Cor.+aA			2 1.75			2 1.71
aA			+ .04			— .01
Slow			2 1.71			2 1.72

MARCH 17, 1902, KIDDER, ST. LOUIS—Continued.

Computations.

					"c"					
Star.	Clamp West.		C.	Star.	Clamp East.		C.			
	1st App.				1st App.					
	m.	s.			m.	s.				
δ Gem.	+2	1.81	+1.08	ε Leo.	+2	1.29	+1.09			
α^2 Gem.		2.06	1.18	μ Leo.		1.49	1.11			
β Gem.		1.79	1.13	α Leo.		1.33	1.03			
26 Lyn.		2.09	1.49	λ U. M.		1.46	1.38			
ζ^1 Can.		1.82	1.05	β L. M.		1.55	1.25			
Mean	+2	1.91	+1.19	Mean	+2	1.42	1.17			

$$c = \frac{(2^m 1^s.91) - (2^m 1^s.42)}{1.19 + 1.17}$$

$$c = +0.21 \text{ Clamp W.}$$

$$c = -0.21 \text{ Clamp E.}$$

Star.	"a" Clamp West. Cor. + aA.		A	Star.	"a" Clamp East. Cor. + aA.		A.
	m.	s.			m.	s.	
δ Gem.	+2	1.58	+0.30	ε Leo.	+2	1.52	+0.27
α^2 Gem.		.81	+0.12	μ Leo.		.72	+0.23
β Gem.		.56	+0.20	α Leo.		.54	+0.45
26 Lyn.		.78	-0.23	λ U. M.		.75	-0.12
ζ^1 Can.		.60	+0.37	β L. M.		.81	+0.02
Mean	+2	1.67	+0.15	Mean	+2	1.67	+0.17
51 Ceph.	+2	5.58	-15.36	1 Drac.	+2	3.53	-4.77
Diff.		-3.91	+15.51	Diff.		-1.86	+4.94

$$a = \frac{-3.91}{15.51}$$

$$a = -0.25$$

$$a = \frac{-1.86}{4.94}$$

$$a = -0.37$$

Chronometer corrections.

	m.	s.
δ Gemin. slow	2	1.66
α^2 Gemin. slow		.84
β Gemin. slow		.61
26 Lyncis slow		.72
ζ^1 Cancri slow		.69
ε Leonis slow		.62
μ Leonis slow		.80
α Leonis slow		.70
λ Ursæ Maj. slow		.71
β Leo. Min. slow		.72

Mean slow

 2 1.70
 +2 1.69
Epoch 9^h 0^m.

Epoch of exchange.

MARCH 17, 1902, KIDDER, ST. LOUIS—Continued.*Exchange signals received at St. Louis.*

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
8	46	58.52	8	49	0.62	8	47	34.55	8	49	36.42	
	47	0.54			2.60			36.54			38.34	
		2.50			4.50			38.53			40.40	
		4.50			6.50			40.50			42.44	
		6.50			8.50			42.48			44.30	
		8.52			10.50			44.50			46.35	
		10.50			12.47			46.50			48.30	
		12.50			14.50			48.50			50.30	
		14.50			16.45			50.50			52.40	
		16.50			18.48			52.48			54.44	
		18.50			20.42			54.50			56.41	
		20.53			22.40			56.35			58.35	
		22.50			24.44							
		24.48			26.47	Mean	8	47	27.50	8	49	29.44
		26.49			28.48	Chr. slow	+ 2	1.69	+ 2	1.69		
		28.48			30.50							
		30.50			32.48	Correct	8	49	29.19	8	51	31.13
		32.50			34.40							

MARCH 17, 1902, MACCONNEL, RED RIVER.*Levels.***CLAMP WEST.**

	Dir.	6 ^h 30 ^m	Rev.	Dir.	8 ^h 15 ^m	Rev.
W.	46.6		17.0	49.0		15.2
E.	16.0		47.2	16.6		47.7
W.	47.8		16.9	49.1		14.6
E.	17.0		47.1	16.5		47.0
Sum	127.4		128.2	131.2		124.5
Diff.		-0.8			+6.7	
$\frac{1}{3}$		0.10			0.84	
d		0 ^o .111			0 ^o .111	
b		-0.01			+0.09	

CLAMP EAST.

	Dir.	9 ^h 10 ^m	Rev.	Dir.	10 ^h 25 ^m	Rev.
W.	49.0		14.8	50.8		15.0
E.	16.0		48.0	17.0		48.9
W.	48.7		15.0	51.6		14.7
E.	15.4		48.3	17.7		48.4
Sum	129.1		126.1	137.1		127.0
Diff.		+3.0			+10.1	
$\frac{1}{3}$		0.38			1.26	
d		0 ^o .111			0 ^o .111	
b		+0.04			+ 0.14	

MARCH 17, 1902, MACCONNEL, RED RIVER—Continued.

Clamp West.

Star	51 Cephei, $\delta=87^{\circ} 12'$						δ Gemin., $\delta=22^{\circ} 10'$					
Factors	A=-16.32 a=-.19 B=+12.38 b=-.01 C=+20.49 c=Corrected						A=+0.23 a=-.19 B=+1.05 b=+.01 C=+1.09 c=0.00					
Wires.	Chron. T.						Chron. T.					
	h. m. s.		h. m. s.				h. m. s.					
1	6	38	12.9	=6	53	9.3	7	11	44.5			
2		45	33.9	=6	53	13.0		12	8.1			
3	6	53	7.1	=6	53	13.3			31.1			
4			Lost						55.7			
5	7	8	8.4	=6	53	12.8		13	18.9			
Mean	6	53	12.00				7	12	31.66			
Rate			-.10	Very cold.					-.08			
Aber.			-.35						-.02			
bB			-.12						+.01			
RA	6	53	11.43				7	12	31.57			
	6	55	1.23				7	14	18.25			
1st App.	+1	49.80					+1	46.68				
cC		0.00						0.00				
Cor.+aA		1	49.80					1	46.68			
aA	(Wires 1 and 2 Cl. E.)								-.04			
Slow	(Wires 3 and 4 Cl. W.)							1	46.72			
Star	α^2 Gemin., $\delta=32^{\circ} 6'$						β Gemin., $\delta=28^{\circ} 16'$					
Factors	A=+0.04 a=-.19 B=+1.18 b=+.03 C=+1.18 c=0.00						A=+0.12 a=-.19 B=+1.13 b=+.05 C=+1.13 c=0.00					
Wires.	Chron. T.						Chron. T.					
	h. m. s.		h. m. s.				h. m. s.					
1	7	25	44.5	=7	26	36.3	7	36	45.0			
2		26	10.7	=7	26	36.5		37	9.9			
3			36.0	=7	36	36.3			34.3			
4	27	2.8	=7	26	36.4			38	0.1			
5			Lost.						24.3			
Mean	7	26	36.38				7	37	34.72			
Rate			-.06	Very cold.					-.04			
Aber.			-.02						-.02			
bB			+.04						+.06			
RA	7	26	36.34				7	37	34.72			
	7	28	23.05				7	39	21.36			
1st App.	+1	46.71					+1	46.64				
cC		0.00						0.00				
Cor.+aA		1	46.71					1	46.64			
aA			-.01						-.02			
Slow		1	46.72					1	46.66			

MARCH 17, 1902, MACCONNEL, RED RIVER—Continued.

Star	26 Lyncis, $\delta=47^\circ 49'$			ζ^1 Cancri, $\delta=17^\circ 57'$		
Factors	A=-0.35	a=-.19		A=+0.30	a=-.19	
	B=+1.45	b=+.07		B=+1.04	b=+.09	
	C=+1.48	c= 0.00		C=+1.07	c= 0.00	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	7	44	45.3	8	4	51.1
2		45	18.0			28.2
3			50.3			51.0
4	46		23.9	5		14.7
5			55.8			37.1
Mean	7	45	50.66	8	4	51.22
Rate			-.04			-.00
Aber.			-.03			-.02
bB			+.10			+.09
RA	7	45	50.69	8	4	51.29
	7	47	37.35	8	6	37.70
1st App.	+1	46.66		+1	46.41	
cC		0.00			0.00	
Cor.+aA	1	46.66		1	46.41	
aA		+.07			-.06	
Slow	1	46.59		1	46.47	

Clamp East.

Star	1 Draconis, $\delta=81^\circ 46'$			ϵ Leonis, $\delta=24^\circ 14'$		
Factors	A=-5.13	a=-.30		A=+0.20	a=-.30	
	B=+4.73	b=+.04		B=+1.09	b=+.06	
	C=+6.98	c= 0.00		C=+1.10	c= 0.00	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	16	24.1	9	37	44.9
2		18	53.4		38	8.6
3		21	30.9			33.4
4		24	1.6			57.0
5		26	35.3		39	21.0
Mean	9	21	29.06	9	38	32.98
Rate			+.10			+.12
Aber.			-.11			-.02
bB			+.19			+.07
RA	9	21	29.24	9	38	33.15
	9	23	17.44	9	40	19.85
1st App.	+1	48.20		+1	46.70	
cC		0.00			0.00	
Cor.+aA	1	48.20		1	46.70	
aA					-.06	
Slow				1	46.76	

MARCH 17, 1902, MACCONNEL, RED RIVER—Continued.

Star.	μ Leonis, $\delta=26^{\circ} 28'$			α Leonis, $\delta=12^{\circ} 27'$		
Factors	A=+0.16	a=-.30		A=+0.38	a=-.30	
	B=+1.10	b=+.08		B=+1.03	b=+.09	
	C=+1.11	c=0.00		C=+1.04	c=0.00	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	44	38.3	10	0	40.0
2		45	2.2		1	2.1
3			27.5			24.9
4			51.8			47.2
5		46	16.1		2	9.8
Mean	9	45	27.18	10	1	24.80
Rate			+.12			+.16
Aber.			-.02			-.02
δB			+.09			+.09
RA	9	45	27.37	10	1	25.03
	9	47	13.95	10.	3	11.66
1st App.	+1	46.58		+1	46.63	
cC		0.00			0.00	
Cor.+aA	1	46.58		1	46.63	
aA		-.05			-.11	
Slow	1	46.63		1	46.74	
Star	λ Ursæ Maj., $\delta=43^{\circ} 24'$			β Leo Min., $\delta=37^{\circ} 13'$		
Factors	A=-0.22	a=-.30		A=-0.06	a=-.30	
	B=+1.36	b=+.11		B=+1.25	b=+.13	
	C=+1.38	c=0.00		C=+1.25	c=0.00	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	10	8	26.9	10	19	34.1
2			56.4		20	0.9
3		9	27.7			29.3
4			57.1			56.5
5		10	27.5		21	24.1
Mean	10	9	27.12	10	20	28.98
Rate			+.16			+.18
Aber.			-.02			-.02
δB			+.15			+.16
RA	10	9	27.41	10	20	29.30
	10	11	14.12	10	22	15.78
1st App.	+1	46.71		+1	46.48	
cC		0.00			0.00	
Cor.+aA	1	46.71		1	46.48	
aA		+.07			-.02	
Slow	1	46.64		1	46.50	

MARCH 17, 1902, MACCONNEL, RED RIVER—Continued.

Computations.

“c”

Clamp West.				Clamp East.			
Star.	1st App.		C.	Star.	1st App.		C.
	m.	s.			m.	s.	
δ Gem.	+1	46.68	+1.09	ϵ Leo.	+1	46.70	+1.10
α^2 Gem.		.71	1.18	μ Leo.		.58	1.11
β Gem.		.64	1.13	α Leo.		.63	1.04
26 Lyn.		.66	1.48	λ U. M.		.71	1.38
ζ^1 Can.		.41	1.07	β L. M.		.48	1.25
Mean	+1	46.62	+1.19	Mean	1	46.62	1.18

$$c = \frac{(1^m 46^s.62) - (1^m 46^s.62)}{1.19 + 1.18}$$

$$c = \pm 0.00$$

Star.	"a" Clamp West.		A	Star.	"a" Clamp East.		A
	Cor. + αA				Cor. + αA		
	m.	s.			m.	s.	
δ Gem.	+1	46.68	+ 0.23	ϵ Leo.	+1	46.70	+0.20
α^2 Gem.		.71	+ 0.04	μ Leo.		.58	+0.16
β Gem.		.64	+ 0.12	α Leo.		.63	+0.38
26 Lyn.		.66	- 0.35	λ U. M.		.71	-0.22
ζ^1 Can.		.41	+ 0.30	β L. M.		.48	-0.06
Mean	+1	46.62	+ 0.07	Mean	+1	46.62	+0.09
51 Cep.	+1	49.80	-16.32	1 Drac.	+1	48.20	-5.13
Diff.		-3.18	+16.39	Diff.		-1.58	+5.22

$$a = \frac{-3.18}{16.39}$$

$$a = -0.19$$

$$a = \frac{-1.58}{5.22}$$

$$a = -0.30$$

Chronometer corrections.

	m.	s.
δ Gemin. slow	1	46.72
α^2 Gemin. slow		.72
β Gemin. slow		.66
26 Lyncis slow		.59
ζ^1 Cancr. slow		.47
ϵ Leonis slow		.76
μ Leonis slow		.63
α Leonis slow		.74
λ Ursæ Maj. slow		.64
β Leo. Min. slow		.50

Mean slow 1 46.64 Epoch of exchange.

MARCH 17, 1902, MACCONNEL, RED RIVER—Continued.*Exchange signals received at Red River.*

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
8	8	1.50	8	10	3.70	8	8	39.50	8	10	41.43	
		3.54			5.67			41.50			43.48	
		5.48			7.54			43.50			45.50	
		7.45			9.50			45.47			47.40	
		9.47			11.60			47.48			49.45	
		11.50			13.60			49.48			51.43	
		13.50			15.53			51.50			53.40	
		15.50			17.60			53.48			55.50	
		17.47			19.50			55.49			57.51	
		19.50			21.51			57.50			59.50	
		21.50			23.50			59.34			61.43	
		23.50			25.48							
		25.48			27.50	Mean	8	8	30.48	8	10	32.52
		27.49			29.53	Chr. slow	+ 1	46.64		+ 1	46.64	
		29.43			31.52							
		31.46			33.57	Correct	8	10	17.12	8	12	19.16
		33.50			35.57	St. Louis	8	49	29.19	8	51	31.13
		35.49			37.52							
		37.53			39.53	Diff.		39	12.07		39	11.97
Mean 39 ^m 12 ^s .02, St. Louis to Red River, March 17, 1902.												

Mean 39^m 12^s .02, St. Louis to Red River, March 17, 1902.**MARCH 18, 1902, KIDDER, ST. LOUIS.***Levels.*

CLAMP WEST.

	W.	6 ^h 35 ^m	E.	W.	8 ^h 10 ^m	E.
Dir.	12.9		6.0	13.4		5.3
Rev.	11.0		7.7	11.2		7.4
Rev.	11.0		7.6	11.2		7.3
Dir.	12.6		6.0	13.6		5.0
Sum	47.5		27.3	49.4		25.0
Diff.		+20.2			+24.4	
$\frac{1}{2}d$		2.53			3.05	
d		0°.136			0°.136	
b		+ 0.34			+ 0.41	

CLAMP EAST.

	W.	9 ^h 15 ^m	E.	W.	10 ^h 25 ^m	E.
Dir.	13.1		5.4	13.0		6.0
Rev.	11.3		7.3	11.0		8.0
Rev.	11.3		7.3	11.0		8.0
Dir.	13.4		5.1	13.0		5.9
Sum	49.1		25.1	48.0		27.9
Diff.		+24.0			+20.1	
$\frac{1}{2}d$		3.00			2.51	
d		0°.136			0°.136	
b		+ 0.41			+ 0.34	

MARCH 18, 1902, KIDDER, ST. LOUIS—Continued.

Clamp West.

Star	51' Cephei, $\delta=87^{\circ} 12'$			δ Gemin., $\delta=22^{\circ} 10'$		
Factors	A=-15.36	a=-.24		A=+0.30	a=-.24	
	B=+13.56	b=+.35		B=+1.03	b=+.36	
	C=+20.49	c=+.20		C=+1.08	c=+.20	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	6	48	10.2	7	12	0.7
2		49	44.1			5.7
3		51	11.1			10.4
4		52	44.8			15.2
5		54	17.1			20.0
6		55	49.2			24.9
7		57	20.0			29.6
Mean	6	52	46.07	7	12	15.21
Rate			-.13			-.11
Aber.			-.34			-.02
bB			+4.74			+.37
RA	6	52	50.34	7	12	15.45
	6	55	0.84	7	14	18.23
1st App.	+2		10.50	+2		2.78
cC			+4.08			+.21
Cor.+aA	2		6.42	2		2.57
aA						-.07
Slow				2		2.64
Star	α^2 Gemin., $\delta=32^{\circ} 6'$			β Gemin., $\delta=28^{\circ} 16'$		
Factors	A=+0.12	a=-.24		A=+0.20	a=-.24	
	B=+1.17	b=+.37		B=+1.12	b=+.38	
	C=+1.18	c=+.20		C=+1.13	c=+.20	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	7	26	4.0	7	37	2.9
2			9.4			8.1
3			14.5			13.2
4			19.8			18.2
5			25.1			23.2
6			30.4			28.1
7			35.9			33.2
Mean	7	26	19.87	7	37	18.13
Rate			-.10			-.08
Aber.			-.02			-.02
bB			+4.43			+4.43
RA	7	26	20.18	7	37	18.46
	7	28	23.03	7	39	21.34
1st App.	+2		2.85	+2		2.88
cC			+.23			+.23
Cor.+aA	2		2.62	2		2.65
aA			-.03			-.05
Slow	2		2.65	2		2.70

MARCH 18, 1902, KIDDER, ST. LOUIS—Continued.

Star	26 Lyncis, $\delta=47^\circ 49'$			ζ' Cancri, $\delta=17^\circ 57'$		
Factors	A=-0.23	a=-.24		A=+0.37	a=-.24	
	B=+1.47	b=+.39		B=+0.98	b=+.40	
	C=+1.49	c=+.20		C=+1.05	c=+.20	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	7	45	13.7	8	4	20.7
2			20.3			25.4
3			27.0			29.9
4			34.0			34.4
5			40.6			39.3
6			47.1			43.8
7			53.8			48.7
Mean	7	45	33.79	8	4	34.60
Rate			-.08			-.06
Aber.			-.03			-.02
bB			+.57			+.38
RA	7	45	34.25	8	4	34.90
	7	47	37.32	8	6	37.68
1st App.	+2		3.07	+2		2.78
cC			+.30			+.21
Cor.+aA	2		2.77	2		2.57
aA			+.06			-.09
Slow	2		2.71	2		2.66

Clamp East.

Star	1 Draconis, $\delta=81^\circ 46'$			ε Leonis, $\delta=24^\circ 14'$		
Factors	A=-4.77	a=-.27		A=+0.27	a=-.27	
	B=+5.09	b=+.40		B=+1.06	b=+.39	
	C=+6.98	c=-.20		C=+1.09	c=-.20	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	19	38.5	9	38	2.3
2		20	10.0			7.2
3			42.2			12.1
4		21	13.0			16.9
5			44.4			21.9
6		22	14.9			26.9
7			46.4			31.6
Mean	9	21	12.77	9	38	16.99
Rate			+.03			+.04
Aber.			-.11			-.02
bB			+2.09			+.41
RA	9	21	14.78	9	38	17.42
	9	23	17.36	9	40	19.84
1st App.	+2		2.58	+2		2.42
cC			-1.39			-.22
Cor.+aA	2		3.97	2		2.64
aA						-.07
Slow				2		2.71

MARCH 18, 1902, KIDDER, ST. LOUIS—Continued.

Star	μ Leonis, $\delta=26^{\circ} 28'$			α Leonis, $\delta=12^{\circ} 27'$		
Factors	A=+0.23	a=-.27		A=+0.45	a=-.27	
	B=+1.09	b=+.38		B=+0.92	b=+.37	
	C=+1.11	c=-.20		C=+1.03	c=-.20	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	44	56.2	10	0	55.0
2		45	1.3			59.7
3			6.2	1		4.4
4			11.1			8.9
5			16.4			13.6
6			20.9			18.1
7			26.1			22.6
Mean	9	45	11.17	10	1	8.90
Rate			+.05			+.06
Aber.			-.02			-.02
bB			+.41			+.34
RA	9	45	11.61	10	1	9.28
	9	47	13.94	10	3	11.65
1st App.	+2		2.33	+2		2.37
cC			-.22			-.21
Cor.+aA	2		2.55	2		2.58
aA			-.06			-.11
Slow	2		2.61	2		2.69
Star	λ Ursæ Maj., $\delta=43^{\circ} 24'$			β Leo. Min., $\delta=37^{\circ} 13'$		
Factors	A=-0.12	a=-.27		A=+0.02	a=-.27	
	B=+1.37	b=+.36		B=+1.25	b=+.35	
	C=+1.38	c=-.20		C=+1.25	c=-.20	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	10	8	52.6	10	19	56.0
2			58.9	20		1.6
3	9		5.2			7.0
4			11.2			12.7
5			17.3			18.5
6			23.3			24.0
7			29.5			29.8
Mean	10	9	11.14	10	20	12.80
Rate			+.08			+.09
Aber.			-.02			-.02
bB			+.49			+.44
RA	10	9	11.69	10	20	13.31
	10	11	14.11	10	22	15.77
1st App.	+2		2.42	+2		2.46
cC			-.27			-.25
Cor.+aA	2		2.69	2		2.71
aA			+.03			0.00
Slow	2		2.66	2		2.71

MARCH 18, 1902, KIDDER, ST. LOUIS—Continued.

Computations.

				"c"				
Star.	Clamp West.		C.	Star.	Clamp East.		C.	
	1st App.				1st App.			
	m.	s.			m.	s.		
δ Gem.	+2	2.78	+1.08	ϵ Leo.	+2	2.42	+1.09	
α^2 Gem.		2.85	1.18	μ Leo.		.33	1.11	
β Gem.		2.88	1.13	α Leo.		.37	1.03	
26 Lyn.		3.07	1.49	λ U. M.		.42	1.38	
ζ^1 Can.		2.78	1.05	β L. M.		.46	1.25	
Mean	+2	2.87	+1.19	Mean	+2	2.40	+1.17	

$$c = \frac{(2^m \ 2^s.87) - (2^m \ 2^s.40)}{1.19 + 1.17}$$

$$c = +0.20 \text{ Clamp W.}$$

$$c = -0.20 \text{ Clamp E.}$$

Clamp 19.				Clamp 19.			
"a"				"a"			
Star.	Clamp West.		A	Star.	Clamp East.		A
	Cor. +aA				Cor. +aA		
	m.	s.			m.	s.	
δ Gem.	+2	2.57	+ 0.30	ϵ Leo.	+2	2.64	+0.27
α^2 Gem.		.62	+ 0.12	μ Leo.		.55	+0.23
β Gem.		.65	+ 0.20	α Leo.		.58	+0.45
26 Lyn.		.77	- 0.23	λ U. M.		.69	-0.12
ζ^1 Can.		.57	+ 0.37	β L. M.		.71	+0.02
Mean	+2	2.64	+ 0.15	Mean	+2	2.63	+0.17
51 Ceph.	+2	6.42	-15.36	1 Drac.	+2	3.97	-4.77
Diff.		-3.78	+15.51	Diff.		-1.34	+4.94

$$a = -\frac{3.78}{15.51}$$

$$a = -0.24$$

$$a = -\frac{1.34}{4.94}$$

$$a = -0.27$$

Chronometer corrections.

	m.	s.	
δ Gemin. slow	2	2.64	
α^2 Gemin. slow		.65	
β Gemin. slow		.70	
26 Lyncis slow		.71	
ζ^1 Cancri slow		.66	
ϵ Leonis slow		.71	
μ Leonis slow		.61	
α Leonis slow		.69	
λ Ursæ Maj. slow		.66	
β Leo. Min. slow		.71	
Mean slow	2	2.67	Epoch 9 ^h 0 ^m .
	+2	2.66	Epoch of exchange.

MARCH 18, 1902, KIDDER, ST. LOUIS—Continued.*Exchange signals received at St. Louis.*

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
8	48	59.70	8	51	0.50	8	49	35.60	8	51	36.56	
	49	1.75			2.45			37.70			38.46	
		3.72			4.42			39.75			40.50	
		5.67			6.35			41.75			42.42	
		7.70			8.46			43.70			44.40	
		9.70			10.46			45.60			46.30	
		11.68			12.50			47.64			48.40	
		13.60			14.50			49.65			50.40	
		15.68			16.56			51.68			52.35	
		17.66			18.52			53.65			54.45	
		19.77			20.50			55.63			56.42	
		21.70			22.50			57.62			58.50	
		23.74			24.52							
		25.68			26.52	Mean	8	49	28.68	8	51	29.46
		27.70			28.50	Chr. slow	+	2	2.66	+	2	2.66
		29.68			30.46							
		31.72			32.52	Correct	8	51	31.34	8	53	32.12
		33.70			34.54							

MARCH 18, 1902, MACCONNEL, RED RIVER.*Levels.***CLAMP WEST.**

	7 ^h 15 ^m			8 ^h 15 ^m	
	Dir.	Rev.		Dir.	Rev.
W.	48.0	17.4		46.8	18.0
E.	18.1	47.0		16.0	48.5
W.	48.0	17.4		47.0	17.7
E.	18.0	47.1		16.4	48.5
Sum	132.1	128.9		126.2	132.7
Diff.	+3.2			-6.5	
$\frac{1}{s}$	0.40			0.81	
d	0 ^o .111			0 ^o .111	
b	+0.04			-0.09	

CLAMP EAST.

	9 ^h 10 ^m			10 ^h 25 ^m	
	Dir.	Rev.		Dir.	Rev.
W.	47.8	17.0		52.2	19.4
E.	16.6	48.0		21.0	50.8
W.	48.8	17.0		48.0	18.7
E.	17.8	48.0		17.0	50.0
Sum	131.0	130.0		138.2	138.9
Diff.	+1.0			-0.7	
$\frac{1}{s}$	0.125			0.09	
d	0 ^o .111			0 ^o .111	
b	+0.01			-0.01	

MARCH 18, 1902, MACCONNEL, RED RIVER—Continued.

Clamp West.

Star	51 Cephei, $\delta=87^{\circ} 12'$	δ Gemin., $\delta=22^{\circ} 10'$
Factors	Lost, clouds.	$A=+0.23$ $a=-.05$ $B=+1.05$ $b=+.03$ $C=+1.09$ $c=+.11$
Wires.		Chron. T.
1		h. m. s.
2		7 11 42.0
3		12 5.7
4		29.0
5		53.4
		13 16.6
Mean		7 12 29.34
Rate		— .04
Aber.		— .02
δB		+ .03
RA		7 12 29.31
		7 14 18.23
1st App.		+1 48.92
cC		+ .12
Cor. + aA		1 48.80
aA		— .01
Slow		1 48.81
Star	α^2 Gemin., $\delta=32^{\circ} 6'$	β Gemin., $\delta=26^{\circ} 16'$
Factors	$A=+0.04$ $a=-0.05$ $B=+1.18$ $b=-0.00$ $C=+1.18$ $c=+0.11$	$A=+0.12$ $a=-.05$ $B=+1.13$ $b=-.03$ $C=+1.13$ $c=+.11$
Wires.	Chron. T.	Chron. T.
	h. m. s.	h. m. s.
1	7 25 42.2	7 36 42.5
2	26 8.0	37 7.6
3	33.7	32.0
4	27 0.4	57.7
5	25.9	38 22.1
Mean	7 26 34.04	7 37 32.38
Rate	— .03	— .02
Aber.	— .02	— .02
δB	0.00	— .03
RA	7 26 33.99	7 37 32.31
	7 28 23.03	7 39 21.34
1st App.	+1 49.04	+1 49.03
cC	+ .13	+ .12
Cor. + aA	1 48.91	1 48.91
aA	0.00	— .01
Slow	1 48.91	1 48.92

MARCH 18, 1902, MACCONNEL, RED RIVER—Continued.

Star	26 Lyncis, $\delta=47^\circ 49'$	ζ Cancri, $\delta=17^\circ 57'$
Factors	Lost, clouds.	$A=+0.30$ $a=-.05$ $B=+1.04$ $b=-.07$ $C=+1.07$ $c=+.11$
Wires.		Chron. T.
		h. m. s.
1		8 4 2.5
2		25.6
3		48.4
4		5 12.1
5		34.8
Mean		8 4 48.68
Rate		— .00
Aber.		— .02
bB		— .07
RA		8 4 48.59
		8 6 37.68
1st App.		+1 49.11
cC		+ .12
Cor. + aA		1 48.99
aA		— .01
Slow		1 49.00

Clamp East.

Star	1 Draconis, $\delta+81^\circ 46'$	ϵ Leonis, $\delta=24^\circ 14'$
Factors	$A=-5.13$ $a=-.05$ $B=+4.73$ $b=+.01$ $C=+6.98$ $c=-.11$	Lost, Clouds.
Wires.	Chron. T.	
	h. m. s.	
1	9 16 23.1	
2	18 53.6	
3	21 31.7	
4	24 2.2	
5	26 35.2	
Mean	9 21 29.16	
Rate	+ .05	
Aber.	— .11	
	+ .05	
RA	9 21 29.15	
	9 23 17.36	
1st App.	+1 48.41	
cC	— .75	
Cor. + aA	1 49.16	
aA		
Slow		

MARCH 18, 1902, MACCONNEL, RED RIVER—Continued.

Star	μ Leonis, $\delta=26^{\circ} 28'$				α Leonis, $\delta=12^{\circ} 27'$									
Factors	A	=	+0.16	a	=	-	.05	A	=	+0.38	a	=	-	.05
	B	=	+1.10	b	=		0.00	B	=	+1.03	b	=		0.00
	C	=	+1.11	c	=	-	.11	C	=	+1.04	c	=	-	.11

Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	44	36.2	10	0	38.0
2		45	0.2		1	0.2
3			25.6			22.9
4			49.5			45.5
5		46	14.1		2	7.7
Mean	9	45	25.12	10	1	22.86
Rate			+ .06			+ .08
Aber.			- .02			- .02
bB			.00			.00
RA	9	45	25.16	10	1	22.92
	9	47	13.94	10	3	11.65
1st App.	+1		48.76	+1		48.73
cC			- .12			- .11
Cor. + αA	1		48.88	1		48.84
αA			- .01			- .02
Slow	1		48.89	1		48.86

Star	λ Ursæ Maj., $\delta=43^{\circ} 24'$				β Leo. Min., $\delta=37^{\circ} 13'$									
Factors	A	=	-0.22	a	=	-	.05	A	=	-0.06	a	=	-	.05
	B	=	+1.36	b	=	-	.01	B	=	+1.25	b	=	-	.01
	C	=	+1.38	c	=	-	.11	C	=	+1.25	c	=	-	.11

Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	10	8	24.9	10	19	31.7
2			54.6			59.0
3		9	25.6		20	27.5
4			55.3			54.5
5		10	25.7		21	22.2
Mean	10	9	25.22	10	20	26.98
Rate			+ .08			+ .09
Aber.			- .02			- .02
bB			- .01			- .01
RA	10	9	25.27	10	20	27.04
	10	11	14.11	10	22	15.77
1st App.	+1		48.84	+1		48.73
cC			- .15			- .14
Cor. + αA	1		48.99	1		48.87
αA			+ .01			- .00
Slow	1		48.98	1		48.87

MARCH 18, 1902, MACCONNEL, RED RIVER—Continued.

Computations.

"c"							
Star.	Clamp West.		C.	Star.	Clamp East.		C.
	1st App.				1st App.		
	m.	s.			m.	s.	
δ Gem.	+1	48.92	+1.09	μ Leo.	+1	48.76	+1.11
α^2 Gem.		49.04	1.18	α Leo.		.73	1.04
β Gem.		49.03	1.13	λ U. M.		.84	1.38
ζ^1 Can.		49.11	1.07	β L. M.		.73	1.25
Mean	+1	49.02	+1.12	Mean	+1	48.77	+1.19

$$c = \frac{(1^m 49^s.02) - (1^m 48^s.77)}{1.12 + 1.19}$$

$$c = +0.11 \quad \text{Clamp West.}$$

$$c = -0.11 \quad \text{Clamp East.}$$

Star.	Cor. + αA		A	
	m.	s.		
δ Gem.	+1	48.80	+0.23	
α^2 Gem.		.91	+0.04	
β Gem.		.91	+0.12	
ζ^1 Can.		.99	+0.30	
μ Leo.		.88	+0.16	
α Leo.		.84	+0.38	
λ U. M.		.99	-0.22	
β L. M.		.87	-0.06	
Mean	+1	48.90	+0.12	$a = \frac{-0.26}{5.25}$
1 Drac.	+1	49.16	-5.13	
Diff.		-0.26	+5.25	$a = -0.05$

Chronometer corrections.

	m.	s.	
δ Gemin. slow	1	48.81	
α^2 Gemin. slow		48.91	
β Gemin. slow		48.92	
ζ^1 Cancr. slow		49.00	
μ Leonis slow		48.89	
α Leonis slow		48.86	
λ Ursæ Maj. slow		48.98	
β Leo. Min. slow		48.87	
Mean slow	1	48.91	Epoch of exchange.

MARCH 18, 1902, MACCONNEL, RED RIVER—Continued.*Exchange signals received at Red River.*

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.		h.	m.	s.	h.	m.	s.
8	10	1.31	8	12	2.22		8	10	39.37	8	12	40.22
		3.40			4.21				41.42			42.25
		5.40			6.17				43.43			44.20
		7.34			8.11				45.40			46.18
		9.35			10.23				47.31			48.08
		11.37			12.28				49.32			50.18
		13.38			14.30				51.34			52.17
		15.28			16.28				53.38			54.15
		17.36			18.32				55.37			56.25
		19.37			20.30				57.34			58.20
		21.43			22.27				59.30			60.22
		23.37			24.30							
		25.40			26.35	Mean	8	10	30.36	8	12	31.23
		27.35			28.30	Chr. slow	+1	48.91		+1	48.91	
		29.38			30.22							
		31.36			32.22	Correct	8	12	19.27	8	14	20.14
		33.38			34.30	St. Louis	8	51	31.34	8	53	32.12
		35.40			36.30							
		37.30			38.35	Diff.	39	12.07		39	11.98	
Mean 39 ^m 12 ^s .025, St. Louis to Red River, March 18, 1902.												

Mean 39^m 12^s.025, St. Louis to Red River, March 18, 1902.**MARCH 26, 1902, MACCONNEL, ST. LOUIS.***Levels.***CLAMP WEST.**

	8 ^h 47 ^m			10 ^h 30 ^m	
	W.	E.		W.	E.
Dir.	12.2	9.0		12.6	9.0
Rev.	13.4	7.9		14.0	7.6
Rev.	12.8	8.8		13.8	8.0
Dir.	12.0	9.1		12.0	9.8
Sum	50.4	34.8		52.4	34.4
Diff.	+15.6			+18.0	
$\frac{1}{3}$	1.95			2.25	
d	0 ^s .136			0 ^s .136	
b	+0.27			+0.31	

CLAMP EAST.

	11 ^h 35 ^m			13 ^h 20 ^m	
	W.	E.		W.	E.
Dir.	11.5	10.1		11.5	10.1
Rev.	13.7	8.0		12.0	9.9
Rev.	13.0	8.5		12.4	9.2
Dir.	12.4	9.1		11.6	10.1
Sum	50.6	35.7		47.5	39.3
Diff.	+14.9			+8.2	
$\frac{1}{3}$	1.86			1.02	
d	0 ^s .136			0 ^s .136	
b	+0.25			+0.14	

MARCH 26, 1902, MACCONNEL, ST. LOUIS—Continued.

Clamp West.

Star	1 Draconis, $\delta=81^{\circ} 46'$			ϵ Leonis, $\delta=24^{\circ} 14'$		
Factors	A=-4.77	a=-0.59		A=+0.27	a=-0.59	
	B=+5.09	b=+ .27		B=+1.06	b=+ .28	
	C=+6.98	c=+ .40		C=+1.09	c=+ .40	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	19	34.4	9	38	3.6
2		20	5.8			8.5
3			37.0			13.3
4		21	9.0			18.4
5			40.4			23.2
6		22	11.0			28.0
7			43.3			33.2
Mean	9	21	8.70	9	38	18.31
Rate			+ .24			+ .19
Aber.			- .11			- .02
bB			+1.38			+ .30
RA	9	21	10.21	9	38	18.68
	9	23	16.60	9	40	19.77
1st App.	+2		6.39	+2		1.09
cC			+2.80			+ .44
Cor.+aA	2		3.59	2		0.65
aA						- .16
Slow				2		0.81
Star	μ Leonis, $\delta=26^{\circ} 25'$			α Leonis, $\delta=12^{\circ} 27'$		
Factors	A=+0.23	a=-0.59		A=+0.45	a=-0.59	
	B=+1.09	b=+ .29		B=+0.92	b=+ .29	
	C=+1.11	c=+ .40		C=+1.03	c=+ .40	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	44	57.4	10	0	56.4
2		45	2.3	1		1.2
3			7.4			5.6
4			12.3			10.1
5			17.2			14.7
6			22.4			19.3
7			27.6			24.0
Mean	9	45	12.37	10	1	10.19
Rate			+ .18			+ .15
Aber.			- .02			- .02
bB			+ .32			+ .27
RA	9	45	12.85	10	1	10.59
	9	47	13.87	10	3	11.60
1st App.	+2		1.02	+2		1.01
cC			+ .45			+ .42
Cor.+aA	2		0.57	2		0.59
aA			- .14			- .27
Slow	2		0.71	2		0.86

MARCH 26, 1902, MACCONNEL, ST. LOUIS—Continued.

Star	λ Ursæ Maj., $\delta=43^{\circ} 24'$	β Leo. Min., $\delta=37^{\circ} 13'$
Factors	Lost, clouds.	$A=+0.02$ $a=-.59$ $B=+1.25$ $b=+.31$ $C=+1.25$ $c=+.40$
Wires.		Chron. T.
1		h. m. s.
2		10 19 57.2
3		20 2.6
4		8.8
5		13.8
6		19.4
7		25.3
		30.9
Mean		10 20 13.93
Rate		+.09
Aber.		-.02
δB		+.39
RA		10 20 14.39
		10 22 15.72
1st App.		+2 1.33
cC		+.50
Cor. + aA		2 0.83
aA		-.01
Slow		2 0.84

Clamp East.

Star	β Leonis, $\delta=15^{\circ} 7'$ (Lost, clouds.)	4 Drac. H., $\delta=78^{\circ} 10'$ (Lost, clouds.)
Star	β Can. Ven., $\delta=41^{\circ} 53'$	α Can. Ven., $\delta=38^{\circ} 51'$
Factors	Lost, clouds.	$A=-0.02$ $a=-.59$ $B=+1.29$ $b=+.20$ $C=+1.29$ $c=-.40$
Wires.		Chron. T.
1		h. m. s.
2		12 49 11.6
3		17.6
4		23.3
5		28.9
6		34.7
7		40.3
		46.4
Mean		12 49 28.97
Rate		-.27
Aber.		-.02
δB		+.26
RA		12 49 28.94
		12 51 29.14
1st App.		+2 0.20
cC		-.52
Cor. + aA		2 0.72
aA		+.01
Slow		2 0.71

MARCH 26, 1902, MACCONNEL, ST. LOUIS—Continued.

Star	ϵ Virginis, $\delta=11^{\circ} 29'$			20 Can. Ven., $\delta=41^{\circ} 5'$		
Factors	A=+0.46	a=−.59		A=−0.06	a=−.59	
	B=+0.91	b=+.18		B=+1.32	b=+.16	
	C=+1.02	c=−.40		C=+1.32	c=−.40	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	12	55	6.8	13	10	53.4
2			11.4			59.2
3			16.0	11		5.5
4			20.4			11.3
5			25.2			17.2
6			29.5			23.2
7			34.1			29.2
Mean	12	55	20.49	13	11	11.29
Rate			−.30			−.33
Aber.			−.02			−.02
δB			+.16			+.21
RA	12	55	20.33	13	11	11.15
	12	57	20.39	13	13	11.40
1st App.			+2 0.06			+2 0.25
cC			−.41			−.53
Cor.+ aA			2 0.47			2 0.78
aA			−.27			+.04
Slow			2 0.74			2 0.74

Computations.

"c"

Star.	Clamp West. 1st App.		C.	Star.	Clamp East. 1st App.		C.
	m.	s.			m.	s.	
ϵ Leo.	+2	1.09	+1.09	α C. V.	+2	0.20	+1.29
μ Leo.		.02	1.11	ϵ Vir.		.06	1.02
α Leo.		.01	1.03	20 C. V.		.25	1.32
β L. M.		.33	1.25				
Mean	+2	1.11	+1.12	Mean	+2	0.17	+1.21

$$c = \frac{(2^m \ 1^s.11) - (2^m \ 0^s.17)}{1.12 + 1.21}$$

$$c = +0.40 \quad \text{Clamp West.}$$

$$c = -0.40 \quad \text{Clamp East.}$$

"a"

Star.	Cor.+ aA		A	
	m.	s.		
ϵ Leo.	+2	0.65	+0.27	
μ Leo.		.57	+0.23	
α Leo.		.59	+0.45	
β L. M.		.83	+0.02	
α C. V.		.72	−0.02	
ϵ Vir.		.47	+0.46	
20 C. V.		.78	−0.06	
Mean	+2	0.66	+0.19	$a = \frac{-2.93}{4.96}$
1 Drac.	+2	3.59	−4.77	$a = -0.59$
Diff.		−2.93	+4.96	

MARCH 26, 1902, MACCONNEL, ST. LOUIS—Continued.

Chronometer corrections.

	m.	s.
ε Leonis slow	2	0.81
μ Leonis slow		.71
α Leonis slow		.86
β Leo. Min. slow		.84
α Can. Ven. slow		.71
ε Virginis slow		.74
20 Can. Ven. slow		.74

Mean slow 2 0.77 Epoch of exchange.

Exchange signals received at St. Louis.

From Red River.			From St. Louis.						From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.		h.	m.	s.	h.	m.	s.	h.	m.	s.
11	16	59.00	11	23	0.85		11	17	35.00	11	23	37.10			
	17	1.00			2.88				37.00			38.93			
		3.08			4.92				39.00			40.95			
		5.07			7.08				41.09			43.00			
		7.10			9.00				43.10			45.00			
		9.00			11.10				45.00			47.00			
		11.02			13.10				47.06			49.03			
		13.00			15.10				49.00			51.00			
		15.00			17.02				51.00			53.00			
		17.07			19.10				53.00			55.00			
		19.03			21.16				55.00			56.93			
		21.08			23.10				57.09			59.00			
		23.10			25.07										
		25.00			27.10		Mean	11	17	28.03	11	23	30.03		
		27.00			29.12		Chr. slow	+ 2	0.77		+ 2	0.77			
		29.00			31.03										
		31.00			33.10		Correct	11	19	28.80	11	25	30.80		
		33.10			35.00										

MARCH 26, 1902, KIDDER, RED RIVER.

Levels.

CLAMP WEST.

	Dir.	9 ^h 0 ^m	Rev.	Dir.	11 ^h 0 ^m	Rev.
W.	51.5		12.5	54.2		9.3
E.	13.0		51.2	13.7		49.9
W.	51.7		11.1	54.2		8.6
E.	12.6		50.0	13.5		49.2
Sum.	128.8		124.8	135.6		117.0
Diff.		+4.0			+18.6	
$\frac{1}{s}$		0.50			2.32	
d		0 ^m .111			0 ^m .111	
b		+0.06			+0.26	

CLAMP EAST.

	Dir.	11 ^h 25 ^m	Rev.	Dir.	13 ^h 5 ^m	Rev.
W.	53.0		7.5	54.8		7.1
E.	12.2		48.2	13.0		49.0
W.	55.0		10.0	55.2		7.7
E.	14.2		50.8	8.1		49.8
Sum.	134.4		116.5	131.1		113.6
Diff.		+17.9			+17.5	
$\frac{1}{s}$		2.24			2.2	
d		0 ^m .111			0 ^m .111	
b		+0.25			+0.24	

MARCH 26, 1902, KIDDER, RED RIVER—Continued.

Clamp West.

Star	1 Draconis, $\delta=81^\circ 46'$	ϵ Leonis, $\delta=24^\circ 14'$
Factors	A=-5.13 a=+.39 B=+4.73 b=+.08 C=+6.98 c=+.31	A=+0.20 a=+.39 B=+1.09 b=+.10 C=+1.10 c=+.31
Wires.	Chron. T.	Chron. T.
	h. m. s.	h. m. s.
1	9 16 22.5	9 37 43.8
2	18 55.6	38 7.8
3	21 27.2	31.1
4	24 5.1	56.4
5	26 34.1	39 19.8
Mean	9 21 28.90	9 38 31.78
Aber.	— .15	— .02
bB	+ .38	+ .11
RA	9 21 29.13 9 23 16.60	9 38 31.87 9 40 19.77
1st App.	+1 47.47	+1 47.90
cC	+2.16	+ .34
Cor.+aA	1 45.31	1 47.56
aA		+ .08
Slow		1 47.48
Star	μ Leonis, $\delta=26^\circ 28'$	α Leonis, $\delta=12^\circ 27'$
Factors	A=+0.16 a=+.39 B=+1.10 b=+.12 C=+1.11 c=+.31	A=+0.38 a=+.39 B=+1.03 b=+.14 C=+1.04 c=+.31
Wires.	Chron. T.	Chron. T.
	h. m. s.	h. m. s.
1	9 44 37.1	10 0 38.6
2	45 1.6	1 1.3
3	25.9	23.2
4	50.9	46.4
5	46 15.0	2 8.4
Mean	9 45 26.10	10 1 23.58
Aber.	— .02	— .02
bB	+ .13	+ .14
RA	9 45 26.21 9 47 13.87	10 1 23.70 10 3 11.60
1st App.	+1 47.66	+1 47.90
cC	+ .34	+ .32
Cor.+aA	1 47.32	1 47.58
aA	+ .06	+ .15
Slow	1 47.26	1 47.43

MARCH 26, 1902, KIDDER, RED RIVER—Continued.

Star	λ Ursæ Maj., $\delta = 43^\circ 24'$			β Leo. Min., $\delta = 37^\circ 13'$		
Factors	A = -0.22	a = +.39		A = -0.06	a = +.39	
	B = +1.36	b = +.16		B = +1.25	b = +.18	
	C = +1.38	c = +.31		C = +1.25	c = +.31	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	10	8	25.8	10	19	33.0
2			56.2		20	0.4
3		9	25.9			27.6
4			57.0			55.8
5		10	26.8		21	23.0
Mean	10	9	26.34	10	20	27.96
Aber.			-.02			-.02
bB			+.22			+.22
RA	10	9	26.54	10	20	28.16
	10	11	14.04	10	22	15.72
1st App.		+1	47.50		+1	47.56
cC			+.43			+.39
Cor. + aA		1	47.07		1	47.17
aA			-.09			-.02
Slow		1	47.16		1	47.19

Clamp East.

Star	β Leonis, $\delta = 15^\circ 7'$			4 Draconis, $\delta = 78^\circ 10'$		
Factors	A = +0.34	a = +.44		A = -3.37	a = +.44	
	B = +0.98	b = +.25		B = +3.53	b = +.25	
	C = +1.04	c = -.31		C = +4.88	c = -.31	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	11	41	33.4	12	2	23.3
2			55.4		4	7.7
3		42	19.0		5	58.6
4			41.3		7	43.6
5		43	4.2		9	30.9
Mean	11	42	18.66	12	5	56.82
Aber.			-.02			-.09
bB			+.25			+.88
RA	11	42	18.89	12	5	57.61
	11	44	6.20	12	7	41.94
1st App.		+1	47.31		+1	44.33
cC			-.32			-1.51
Cor. + aA		1	47.63		1	45.84
aA			+.15			
Slow		1	47.48			

MARCH 26, 1902, KIDDER, RED RIVER—Continued.

Star	β Can. Ven., $\delta = -41^\circ 53'$			α Can. Ven., $\delta = 38^\circ 51'$		
Factors	A = -0.17	a = +.44		A = -0.10	a = +.44	
	B = +1.32	b = +.25		B = +1.28	b = +.24	
	C = +1.34	c = -.31		C = +1.29	c = -.31	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	12	26	22.0	12	48	46.0
2			51.1		49	13.1
3		27	20.9			42.5
4			50.3		50	10.2
5		28	19.8			38.3
Mean	12	27	20.82	12	49	42.02
Aber.			-.02			-.02
bB			+.33			+.31
RA	12	27	21.13	12	49	42.31
	12	29	8.00	12	51	29.14
1st App.		+1	46.87		+1	46.83
cC			-.42			-.40
Cor. + aA		1	47.29		1	47.23
aA			-.07			-.04
Slow		1	47.36		1	47.27
Star	ϵ Virginis, $\delta = 11^\circ 29'$			20 Can. Ven., $\delta = 41^\circ 5'$		
Factors	A = +0.40	a = +.44		A = -0.16	a = +.44	
	B = +0.94	b = +.24		B = +1.32	b = +.24	
	C = +1.02	c = -.31		C = +1.32	c = -.31	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	12	54	48.6	13	10	26.1
2		55	10.4			54.8
3			33.5		11	24.5
4			55.6			53.3
5		56	18.0		12	22.5
Mean	12	55	33.22	13	11	24.24
Aber.			-.02			-.02
bB			+.22			+.32
RA	12	55	33.42	13	11	24.54
	12	57	20.39	13	13	11.40
1st App.		+1	46.97		+1	46.86
cC			-.32			-.41
Cor. + aA		1	47.29		1	47.27
aA			+.18			-.07
Slow		1	47.11		1	47.34

MARCH 26, 1902, KIDDER, RED RIVER—Continued.

Computations.

Star.	Clamp West.		C.	Star.	Clamp East.		C.
	1st App.	m. s.			1st App.	m. s.	
ϵ Leo.	+1	47.90	+1.10	β Leo.	+1	47.31	+1.04
μ Leo.		.66	1.11	β C. V.		46.87	1.34
α Leo.		.90	1.04	α C. V.		.83	1.29
λ U. M.		.50	1.38	ϵ Vir.		.97	1.02
β L. M.		.56	1.25	20 C. V.		.86	1.32
Mean	+1	47.70	+1.18	Mean	+1	46.97	+1.20

$$c = \frac{(1^m 47^s.70) - (1^m 46^s.97)}{1.18 + 1.20}$$

$$c = +0.31 \text{ Clamp W.}$$

$$c = -0.31 \text{ Clamp E.}$$

Star.	Clamp West.		A	Star.	Clamp East.		A
	Cor. + aA	m. s.			Cor. + aA	m. s.	
ϵ Leo.	+1	47.56	+0.20	β Leo.	+1	47.63	+0.34
μ Leo.		.32	+0.16	β C. V.		.29	-0.17
α Leo.		.58	+0.38	α C. V.		.23	-0.10
λ U. M.		.07	-0.22	ϵ Vir.		.29	+0.40
β L. M.		.17	-0.06	20 C. V.		.27	-0.16
Mean	+1	47.34	+0.09	Mean	+1	47.34	+0.06
1 Drac.	+1	45.31	-5.13	4 Drac.	+1	45.84	-3.37
Diff.		+2.03	+5.22	Diff.		+1.50	+3.43

$$a = \frac{+2.03}{5.22}$$

$$a = +0.39$$

$$a = \frac{+1.50}{3.43}$$

$$a = +0.44$$

Chronometer corrections.

	m.	s.
ϵ Leonis slow	1	47.48
μ Leonis slow		.26
α Leonis slow		.43
λ Ursæ Maj. slow		.16
β Leo. Min. slow		.19
β Leonis slow		.48
β Can. Ven. slow		.36
α Can. Ven. slow		.21
ϵ Virginis slow		.11
20 Can. Ven. slow		.34

Mean slow 1 47.308

Epoch 11^h 15^m.Epoch of exchange + 1^m 47.30^s.

MARCH 26, 1902, KIDDER, RED RIVER—Continued.*Exchange signals received at Red River.*

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
10	38	0.50	10	44	2.40	10	38	38.45	10	44	40.50	
		2.45			4.44			40.48			42.50	
		4.55			6.50			42.52			44.52	
		6.50			8.60			44.50			46.58	
		8.50			10.56			46.45			48.54	
		10.46			12.68			48.50			50.60	
		12.50			14.65			50.46			52.52	
		14.46			16.65			52.50			54.54	
		16.45			18.60			54.44			56.58	
		18.48			20.68			56.45			58.50	
		20.48			22.78			58.50			60.52	
		22.48			24.70							
		24.50			26.60	Mean	10	38	29.48	10	44	31.59
		26.50			28.68	Chr. slow	+1	47.30		+1	47.30	
		28.48			30.70							
		30.45			32.60	Correct	10	40	16.78	10	46	18.89
		32.46			34.70	St. Louis	11	19	28.80	11	25	30.80
		34.55			36.60							
		36.45			38.60	Diff.	39	12.02		39	11.91	
Mean 39 ^m 11 ^s . 965, St. Louis to Red River, March 26, 1902.												

Mean 39^m 11^s. 965, St. Louis to Red River, March 26, 1902.**MARCH 30, 1902, MACCONNEL, ST. LOUIS.***Levels.*

CLAMP EAST.

	9 ^h 0 ^m			10 ^h 30 ^m	
	W.	E.		W.	E.
Dir.	14.3	3.8		13.5	5.2
Rev.	14.0	4.0		13.8	5.0
Rev.	13.0	4.7		14.6	4.3
Dir.	14.0	3.8		12.7	6.2
Sum	55.3	16.3		54.6	20.7
Diff.	+39.0			+33.9	
$\frac{1}{s}$	4.88			4.24	
d	0 ^s . 136			0 ^s . 136	
b	+ 0.66			+ 0.58	

CLAMP WEST.

	10 ^h 45 ^m			12 ^h 20 ^m	
	W.	E.		W.	E.
Dir.	13.1	5.7		14.2	5.9
Rev.	14.2	4.8		15.0	5.0
Rev.	15.0	4.0		15.3	4.8
Dir.	12.2	6.7		14.2	5.9
Sum	54.5	21.2		58.7	21.6
Diff.	+33.3			+37.1	
$\frac{1}{s}$	4.16			4.64	
d	0 ^s . 136			0 ^s . 136	
b	+ 0.57			+ 0.63	

MARCH 30, 1902, MACCONNEL, ST. LOUIS—Continued.

Clamp East.

Star	1 Draconis, $\delta=81^\circ 46'$			ϵ Leonis, $\delta=24^\circ 14'$		
Factors	A=-4.77	a=-.40		A=+0.27	a=-.40	
	B=+5.09	b=+.65		B=+1.06	b=+.64	
	C=+6.98	c=-.37		C=+1.09	c=-.37	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	19	53.1	9	38	17.9
2		20	24.7			22.9
3			55.8			27.9
4		21	26.6			32.6
5			58.3			37.7
6		22	28.9			42.7
7		23	0.3			47.5
Mean	9	21	26.81	9	38	32.74
Rate			+.24			+.19
Aber.			-.11			-.02
δB			+3.31			+.68
RA	9	21	30.25	9	38	33.59
	9	23	16.19	9	40	19.72
1st App.		+1	45.94		+1	46.13
cC			-2.58			-.39
Cor.+aA		1	48.52		1	46.52
aA						-.11
Slow					1	46.63
Star	μ Leonis, $\delta=26^\circ 25'$			α Leonis, $\delta=12^\circ 27'$		
Factors	A=+0.23	a=-.40		A=+0.45	a=-.40	
	B=+1.09	b=+.63		B=+0.92	b=+.61	
	C=+1.11	c=-.37		C=+1.03	c=-.37	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	45	11.9	10	1	11.0
2			17.1			15.6
3			21.8			20.2
4			26.9			24.7
5			31.9			29.5
6			36.9			34.0
7			42.1			38.6
Mean	9	45	26.94	10	1	24.80
Rate			+.18			+.15
Aber.			-.02			-.02
δB			+.69			+.56
RA	9	45	27.79	10	1	25.49
	9	47	13.82	10	3	11.56
1st App.		+1	46.03		+1	46.07
cC			-.40			-.38
Cor.+aA		1	46.43		1	46.45
aA			-.09			-.18
Slow		1	46.52		1	46.63

MARCH 30, 1902, MACCONNEL, ST. LOUIS—Continued.

Star	λ Ursæ Maj., $\delta=43^{\circ} 24'$			β Leo. Min., $\delta=37^{\circ} 13'$		
Factors	A=-0.12	a=-.40		A=+0.02	a=-.40	
	B=+1.37	b=+.60		B=+1.25	b=+.59	
	C=+1.38	c=-.37		C=+1.25	c=-.37	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	10	9	8.5	10	20	11.7
2			14.9			17.5
3			20.9			23.1
4			26.9			28.7
5			33.2			34.5
6			39.0			39.8
7			45.3			45.8
Mean	10	9	26.96	10	20	28.73
Rate			+.12			+.09
Aber.			-.02			-.02
bB			+.82			+.74
RA	10	9	27.88	10	20	29.54
	10	11	13.99	10	22	15.68
1st App.	+1	46.11		+1	46.14	
cC		-.51			-.46	
Cor.+aA	1	46.62		1	40.60	
aA		+.05			-.01	
Slow	1	46.57		1	46.61	

Clamp West.

Star	β Leonis, $\delta=15^{\circ} 7'$			γ Draconis, $\delta=78^{\circ} 10'$		
Factors	A=+0.41	a=-.30		A=-3.11	a=-.30	
	B=+.95	b=+.57		B=+3.76	b=+.58	
	B=+1.04	c=+.37		C=+4.88	c=+.37	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	11	42	4.7	12	4	44.9
2			9.8	5		7.2
3			14.3			29.1
4			19.0			50.8
5			23.7	6		12.1
6			28.3			34.2
7			33.0			56.2
Mean	11	42	18.97	12	5	50.64
Rate			-.11			-.16
Aber.			-.02			-.07
bB			+.54			+2.18
RA	11	42	19.38	12	5	52.59
	11	44	6.21	12	7	41.92
1st App.	+1	46.83		+1	49.33	
cC		+.39			+1.81	
Cor.+aA	1	46.44		1	47.52	
aA		-.12				
Slow	1	46.56				

MARCH 30, 1902, MACCONNEL, ST. LOUIS—Continued.

Star	β Can. Ven., $\delta=41^{\circ} 53'$			α Can. Ven., $\delta=38^{\circ} 51'$		
Factors	A = -0.07	a = -0.30		A = -0.02	a = - .30	
	B = +1.34	b = +0.59		B = +1.29	b = + .60	
	C = +1.35	c = +0.37		C = +1.29	c = + .37	
Wires.	Chron T.			Chron T.		
	h.	m.	s.	h.	m.	s.
1	12	27	2.2	12	49	24.3
2			8.2			30.2
3			14.4			36.1
4			20.3			41.7
5			26.3			47.5
6			32.1			53.0
7			38.4			58.9
Mean	12	27	20.27	12	49	41.67
Rate			-.23			-.27
Aber.			-.02			-.02
bB			+.79			+.77
RA	12	27	20.81	12	49	42.15
	12	29	8.02	12	51	29.17
1st App.	+1		47.21	+1		47.02
cC			+.50			+.48
Cor. + aA	1		46.71	1		46.54
aA			+.02			+.01
Slow	1		46.69	1		46.53
Star	ϵ Virginis, $\delta=11^{\circ} 29'$			20 Can. Ven., $\delta=41^{\circ} 5'$		
Factors	A = +0.46	a = - .30		Lost, clouds.		
	B = +0.91	b = + .61				
	C = +1.02	c = + .37				
Wires.	Chron T.					
	h.	m.	s.			
1	12	55	19.6			
2			24.1			
3			28.6			
4			33.3			
5			38.2			
6			42.6			
7			47.2			
Mean	12	55	33.36			
Rate			-.30			
Aber.			-.02			
bB			+.56			
RA	12	55	33.60			
	12	57	20.42			
1st App.	+1		46.82			
cC			+.38			
Cor. + aA	1		46.44			
aA			-.14			
Slow	1		46.58			

MARCH 30, 1902, MACCONNEL, ST. LOUIS—Continued.

Computations.

Star.	Clamp East. 1st App.		C.	Star.	Clamp West. 1st App.		C.
	m.	s.			m.	s.	
ϵ Leo.	+1	46.13	+1.09	β Leo.	+1	46.83	+1.04
μ Leo.		.03	1.11	β C. V.		47.21	1.35
α Leo.		.07	.03	α C. V.		47.02	1.29
λ U. M.		.11	1.38	ϵ Vir.		46.82	1.02
β L. M.		.14	1.25				
Mean	+1	46.10	+1.17	Mean	+1	46.97	+1.17

$$c = \frac{(1^m 46^s.10) - (1^m 46^s.97)}{1.17 + 1.17}$$

c = -0.37 Clamp East.

c = +0.37 Clamp West.

Star.	Clamp East. Cor. + aA		A	Star.	Clamp West. Cor. + aA		A
	m.	s.			m.	s.	
ϵ Leo.	+1	46.52	+0.27	β Leo.	+1	46.44	+0.41
μ Leo.		.43	+0.23	β C. V.		.71	-0.07
α Leo.		.45	+0.45	α C. V.		.54	-0.02
λ U. M.		.62	-0.12	ϵ Vir.		.44	+0.46
β L. M.		.60	+0.02				
Mean	+1	46.52	+0.17	Mean	+1	46.53	+0.19
1 Drac.	+1	48.52	-4.77	4 Drac.	+1	47.52	-3.11
Diff.		-2.00	+4.94	Diff.		-0.99	+3.30

$$a = \frac{-2.00}{4.94}$$

$$a = -0.40$$

$$a = \frac{-0.99}{3.30}$$

$$a = -0.30$$

Chronometer corrections.

	m.	s.
ϵ Leonis slow	1	46.63
μ Leonis slow		.52
α Leonis slow		.63
λ Ursæ Maj. slow		.57
β Leo. Min. slow		.61
β Leonis slow		.56
β Can. Ven. slow		.69
α Can. Ven. slow		.53
ϵ Virginis slow		.58

Mean slow 1 46.59 Epoch of exchange.

MARCH 30, 1902, MACCONNEL, ST. LOUIS—Continued.*Exchange signals received at St. Louis.*

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
11	2	16.40	11	3	59.90	11	2	52.42	11	4	36.40	
		18.40		4	2.43			54.46			38.48	
		20.40			4.45			56.50			40.48	
		22.42			6.50			58.50			42.50	
		24.44			8.43	3		00.44			44.46	
		26.40			10.50			2.48			46.44	
		28.40			12.48			4.47			48.40	
		30.40			14.50			6.50			50.40	
		32.45			16.43			8.40			52.47	
		34.44			18.40			10.50			54.50	
		36.38			20.40			12.45			56.43	
		38.39			22.45			14.35			58.38	
		40.40			24.40							
		42.45			26.38	Mean	11	2	45.43	11	4	29.41
		44.44			28.36	Chr. slow	+1	46.59	+1	46.59		
		46.42			30.40							
		48.50			32.40	Correct	11	4	32.02	11	6	16.00
		50.42			34.41							

MARCH 30, 1902, KIDDER, RED RIVER.*Levels.***CLAMP WEST.**

	Dir.	9 ^h 0 ^m	Rev.	Dir.	10 ^h 45 ^m	Rev.
W.	49.3		13.2	50.0		11.1
E.	12.4		50.1	11.1		50.0
W.	49.0		13.0	50.0		11.6
E.	11.9		50.0	10.6		50.8
Sum	122.6		126.3	121.7		123.5
Diff.		-3.7			-1.8	
$\frac{1}{2}$		0.46			0.225	
d		0°.111			0°.111	
b		-0.05			-0.03	

CLAMP EAST.

	Dir.	11 ^h 30 ^m	Rev.	Dir.	13 ^h 5 ^m	Rev.
W.	50.8		9.8	50.4		11.0
E.	10.5		50.0	9.7		51.9
W.	51.5		10.4	51.5		11.1
E.	11.0		50.9	10.4		52.0
Sum.	123.8		121.1	122.0		126.0
Diff.		+2.7			-4.0	
$\frac{1}{2}$		0.34			0.50	
d		0°.111			0°.111	
b		+0.04			-0.06	

MARCH 30, 1902, KIDDER, RED RIVER—Continued.

Clamp West.

Star	1 Draconis, $\delta=81^{\circ} 46'$			ε Leonis, $\delta=24^{\circ} 14'$		
Factors	A=-5.13	a=+.44		A=+0.20	a=+.44	
	B=+4.73	b=-.05		B=+1.09	b=-.05	
	C=+6.98	c=+.25		C=+1.10	c=+.25	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	16	21.3	9	37	41.9
2		18	55.2		38	6.0
3		21	25.4			29.5
4		24	2.9			54.2
5		26	33.2		39	17.8
Mean	9	21	27.60	9	38	29.88
Aber.			-.15			-.02
bB			-.23			-.05
RA	9	21	27.22	9	38	29.81
	9	23	16.19	9	40	19.72
1st App.		+1	48.97		+1	49.91
cC			+1.76			+1.28
Cor.+aA		1	47.21		1	49.63
aA						+1.09
Slow					1	49.54
Star	μ Leonis, $\delta=26^{\circ} 28'$			α Leonis, $\delta=12^{\circ} 27'$		
Factors	A=+0.16	a=+.44		A=+0.38	a=+.44	
	B=+1.10	b=-.04		B=+1.03	b=-.04	
	C=+1.11	c=+.25		C=+1.04	c=+.25	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	44	35.1	10	0	36.8
2			59.8			59.1
3		45	23.6		1	21.2
4			48.8			44.2
5		46	13.0		2	6.6
Mean	9	45	24.06	10	1	21.58
Aber.			-.02			-.02
bB			-.04			-.04
RA	9	45	24.00	10	1	21.52
	9	47	13.82	10	3	11.56
1st App.		+1	49.82		+1	50.04
cC			+1.28			+1.26
Cor.+aA		1	49.54		1	49.78
aA			+1.07			+1.17
Slow		1	49.47		1	49.61

MARCH 30, 1902, KIDDER, RED RIVER—Continued.

Star	λ Ursae Maj., $\delta=43^{\circ} 24'$			β Leo. Min., $\delta=37^{\circ} 13'$		
Factors	A=-0.22 $a=+.44$ B=+1.36 $b=-.03$ C=+1.38 $c=+.25$			A=-0.06 $a=+.44$ B=+1.25 $b=-.03$ C=+1.25 $c=+.25$		
Wires.	Chron. T. h. m. s.			Chron. T. h. m. s.		
1	10	8	24.1	10	19	31.0
2			54.3			58.7
3		9	24.1	20		25.5
4			55.3			54.2
5		10	24.8	21		20.9
Mean	10	9	24.52	10	20	26.06
Aber.			-.02			-.02
δB			-.04			-.04
RA	10	9	24.46	10	20	26.00
	10	11	13.99	10	22	15.68
1st App.		+1	49.53		+1	49.68
cC			+.35			+.31
Cor.+aA		1	49.18		1	49.37
aA			-.10			-.03
Slow		1	49.28		1	49.40

Clamp East.

Star	β Lenois, $\delta=15^{\circ} 7'$			4 Draconis, $\delta=78^{\circ} 10'$		
Factors	A=+0.34 $a=+.48$ B=+0.98 $b=+.03$ C=+1.04 $c=-.25$			A=-3.37 $a=+.48$ B=+3.53 $b=+.01$ C=+4.88 $c=-.25$		
Wires.	Chron. T. h. m. s.			Chron. T. h. m. s.		
1	11	41	31.4	12	2	22.3
2			54.0	4		6.8
3		42	17.2	5		56.5
4			39.6	7		42.1
5		43	2.5	9		29.0
Mean	11	42	16.94	12	5	55.34
Aber.			-.02			-.09
δB			+.03			+.04
RA	11	42	16.95	12	5	55.29
	11	44	6.21	12	7	41.92
1st App.		+1	49.26		+1	46.63
			-.26			-1.23
Cor.+aA		1	49.52		1	47.86
aA			+.16			
Slow		1	49.36			

MARCH 30, 1902, KIDDER, RED RIVER—Continued.

Star	β Can. Ven., $\delta=41^\circ 53'$			α Can. Ven., $\delta=38^\circ 51'$		
Factors	A=-0.17	a=+.48		A=-0.10	a=+.48	
	B=+1.32	b=-.01		B=+1.28	b=-.03	
	C=+1.34	c=-.25		C=+1.29	c=-.25	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	12	26	20.4	12	48	44.0
2			49.0		49	11.3
3		27	19.5			40.3
4			48.4		50	8.1
5		28	18.1			36.5
Mean	12	27	19.08	12	49	40.04
Aber.			-.02			-.02
bB			-.01			-.04
RA	12	27	19.05	12	49	39.98
	12	29	8.02	12	51	29.17
cC		+1	48.97		+1	49.19
			-.34			-.33
Cor.+aA		1	49.31		1	49.52
aA			-.08			-.05
Slow		1	49.39		1	49.57
Star	ϵ Virginis, $\delta=11^\circ 29'$			20 Can. Ven., $\delta=41^\circ 5'$		
Factors	A=+0.40	a=+.48		A=-0.16	a=+.48	
	B=+0.94	b=-.05		B=+1.32	b=-.07	
	C=+1.02	c=-.25		C=+1.32	c=-.25	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	12	54	46.5	13	10	24.1
2		55	8.4			52.9
3			31.5		11	22.6
4			53.4			51.6
5		56	15.9		12	20.5
Mean	12	55	31.14	13	11	22.34
Aber.			-.02			-.02
bB			-.05			-.09
RA	12	55	31.07	13	11	22.23
	12	57	20.42	13	13	11.46
1st App.		+1	49.35		+1	49.23
cC			-.26			-.33
Cor.+aA		1	49.61		1	49.56
aA			+.19			-.08
Slow		1	49.42		1	49.64

MARCH 30, 1902, KIDDER, RED RIVER—Continued.

Computations.

"c"

Star.	Clamp West. 1st App.		C.	Star.	Clamp East. 1st App.		C.
	m.	s.			m.	s.	
ε Leo.	+1	49.91	+1.10	β Leo.	+1	49.26	+1.04
μ Leo.		49.82	1.11	β C. V.		48.97	1.34
α Leo.		50.04	1.04	α C. V.		49.19	1.29
λ U. M.		49.53	1.38	ε Vir.		49.35	1.02
β L. M.		49.68	1.25	20 C. V.		49.23	1.32
Mean	+1	49.80	+1.18	Mean	+1	49.20	+1.20

$$c = \frac{(1^m 49^s.80) - (1^m 49^s.20)}{1.18 + 1.20}$$

c = +0.25 Clamp West.

c = -0.25 Clamp East.

"a"

Star.	Clamp West. Cor. + aA.		A.	Star.	Clamp East. Cor. + aA.		A.
	m.	s.			m.	s.	
ε Leo.	+1	49.63	+0.20	β Leo.	+1	49.52	+0.34
μ Leo.		.54	+0.16	β C. V.		.31	-0.17
α Leo.		.78	+0.38	α C. V.		.52	-0.10
λ U. M.		.18	-0.22	ε Vir.		.61	+0.40
β L. M.		.37	-0.06	20 C. V.		.56	-0.16
Mean	+1	49.50	+0.09	Mean	+1	49.50	+0.06
1 Drac.	+1	47.21	-5.13	4 Drac.	+1	47.86	-3.37
Diff.		+2.29	+5.22	Diff.		+1.64	+3.43

$$a = \frac{+2.29}{5.22}$$

$$a = +0.44$$

$$a = \frac{+1.64}{3.43}$$

$$a = +0.48$$

Chronometer corrections.

	m.	s.
ε Leonis slow	1	49.54
μ Leonis slow		.47
α Leonis slow		.61
λ Ursæ Maj. slow		.28
β Leo. Min. slow		.40
β Leonis slow		.36
β Can. Ven. slow		.39
α Can. Ven. slow		.57
ε Virginis slow		.42
20 Can. Ven. slow		.64

Mean slow 1 49.47 Epoch of exchange.

MARCH 30, 1902, KIDDER, RED RIVER—Continued.*Exchange signals received at Red River.*

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
10	23	1.48	10	24	45.05	10	23	39.50	10	25	23.62	
		3.41			47.60			41.53			25.60	
		5.44			49.60			43.51			27.62	
		7.50			51.60			45.49			29.60	
		9.48			53.54			47.50			31.60	
		11.46			55.62			49.50			33.60	
		13.45			57.60			51.53			35.60	
		15.45			59.62			53.50			37.60	
		17.50	25		1.60			55.52			39.62	
		19.48			3.52			57.50			41.60	
		21.44			5.56			59.40			43.50	
		23.42			7.57							
		25.45			9.50	Mean	10	23	30.48	10	25	14.56
		27.50			11.50	Chr. slow		+1	49.47		+1	49.47
		29.50			13.50							
		31.49			15.55	Correct	10	25	19.95	10	27	4.03
		33.52			17.55	St. Louis	11	4	32.02	11	6	16.00
		35.48			19.60							
		37.50			21.58	Diff.		+39	12.07		39	11.97
Mean 39 ^m 12 ^s .02, St. Louis to Red River, March 30, 1902.												

Mean 39^m 12^s.02, St. Louis to Red River, March 30, 1902.**APRIL 4, 1902, MACCONNEL, ST. LOUIS.***Levels.***CLAMP WEST.**

	W.	9 ^a 0 ^m	E.	W.	10 ^a 35 ^m	E.
Dir.	11.3		7.0	11.1		6.9
Rev.	8.0		10.4	7.8		10.0
Rev.	8.1		10.0	7.3		10.8
Dir.	10.7		7.0	10.0		8.0
Sum	38.1		34.4	36.2		35.7
Diff.		+3.7			+0.5	
$\frac{1}{s}$		0.46			0.06	
d		0 ^s .136			0 ^s .136	
b		+0.06			+0.01	

CLAMP EAST.

	W.	11 ^a 34 ^m	E.	W.	12 ^a 20 ^m	E.
Dir.	9.9		8.1	9.8		8.9
Rev.	7.1		11.0	7.6		10.9
Rev.	7.5		10.8	7.3		11.0
Dir.	10.8		7.1	8.4		9.7
Sum	35.3		37.0	36.1		30.5
Diff.		-1.7			+2.6	
$\frac{1}{s}$		0.21			0.32	
d		0 ^s .136			0 ^s .136	
b		-0.03			+0.04	

APRIL 4, 1902, MACCONNEL, ST. LOUIS—Continued.

Clamp West.

Star	1 Draconis, $\delta=81^\circ 48'$			ϵ Leonis, $\delta=24^\circ 14'$		
Factors	A=-4.77	a=-0.08		A=+0.27	a=-0.08	
	B=+5.09	b=+ .06		B=+1.06	b=+ .05	
	C=+6.98	c=+ .35		C=+1.09	c=+ .35	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	20	10.0	9	38	35.9
2			41.3			40.9
3		21	12.8			45.7
4			43.6			50.5
5		22	14.4			55.5
6			46.4	39		0.3
7		23	18.1			5.4
Mean	9	21	43.80	9	38	50.60
Rate			+.24			+.19
Aber.			-.11			-.02
bB			+.31			+.05
RA	9	21	44.24	9	38	50.82
	9	23	15.61	9	40	19.65
1st App.	+1	31.37		+1	28.83	
cC		+2.43			+.38	
Cor.+aA	1	28.94		1	28.45	
aA					-.02	
Slow				1	28.47	
Star	μ Leonis, $\delta=26^\circ 25'$			α Leonis, $\delta=12^\circ 27'$		
Factors	A=+0.23	a=-.08		A=+0.45	a=-.08	
	B=+1.09	b=+.04		B=+ .92	b=+.03	
	C=+1.11	c=+.35		C=+1.03	c=+.35	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	45	29.6	10	1	28.6
2			34.8			33.5
3			39.6			37.9
4			44.4			42.6
5			49.8			47.1
6			54.9			51.7
7			59.7			56.3
Mean	9	45	44.69	10	1	42.53
Rate			+.18			+.15
Aber.			-.02			-.02
bB			+.04			+.03
RA	9	45	44.89	10	1	42.69
	9	47	13.75	10	3	11.51
1st App.	+1	28.86		+1	28.82	
cC		+3.39			+.36	
Cor.+aA	1	28.47		1	28.46	
aA			-.02		-.04	
Slow	1	28.49		1	28.50	

APRIL 4, 1902, MACCONNEL, ST. LOUIS—Continued.

Star	λ Ursæ Maj., $\delta=43^{\circ} 24'$			β Leo. Min., $\delta=37^{\circ} 13'$		
Factors	A=-0.12	a=-.08		A=+0.02	a=-.08	
	B=+1.37	b=+.02		B=+1.25	b=+.01	
	C=+1.38	c=+.35		C=+1.25	c=+.35	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	10	9	26.2	10	20	29.7
2			32.3			34.9
3			38.6			40.7
4			44.8			46.2
5			50.8			52.0
6			57.1			57.5
7	10		3.2	21		3.3
Mean	10	9	44.71	10	20	46.33
Rate			+.12			+.09
Aber.			-.02			-.02
bB			+.03			+.01
RA	10	9	44.84	10	20	46.41
	10	11	13.92	10	22	15.62
1st App.		+1	29.08		+1	29.21
cC			+.48			+.44
Cor.+aA		1	28.60		1	28.77
aA			+.01			0.00
Slow		1	28.59		1	28.77

Clamp East.

Star	β Leonis, $\delta=15^{\circ} 7'$			4 Draconis, $\delta=78^{\circ} 10'$		
Factors	A=+0.41	a=-.08		A=-3.11	a=-.08	
	B=+0.95	b=-.02		B=+3.76	b=-.01	
	C=+1.04	c=-.35		C=+4.88	c=-.35	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	Lost.		
1	11	42	24.1			
2			28.9			
3			33.8			
4			38.3			
5			42.9			
6			47.4			
7			52.1			
Mean	11	42	38.21			
Rate			-.11			
Aber.			-.02			
bB			-.02			
RA	11	42	38.06			
	11	44	6.20			
1st App.		+1	28.14			
cC			-.36			
Cor.+aA		1	28.50			
aA			-.03			
Slow		1	28.53			

APRIL 4, 1902, MACCONNEL, ST. LOUIS—Continued.

Star	β Can. Ven., $\delta=41^\circ 53'$				α Can. Ven., $\delta=38^\circ 51'$			
Factors	A=-0.07	a=-.08	B=+1.34	b= .00	A=-0.02	a=-.08	B=+1.29	b=+.01
	C=+1.35	c=-.35			C=+1.29	c=-.35		
Wires.	Chron. T.				Chron. T.			
	h.	m.	s.		h.	m.	s.	
1	12	27	22.1		12	49	43.9	
2			28.3				50.1	
3			34.1				55.8	
4			40.0		50		1.3	
5			46.4				7.0	
6			52.4				12.9	
7			58.3				18.6	
Mean	12	27	40.23		12	50	1.39	
Rate			-.23				-.27	
Aber.			-.02				-.02	
δB			-.00				+.01	
RA	12	27	39.98		12	50	1.11	
	12	29	8.02		12	51	29.20	
1st App.	+1	28.04			+1	28.09		
cC		-.47				-.45		
Cor.+aA	1	28.51			1	28.54		
aA		+.01				.00		
Slow	1	28.50			1	28.54		
Star	ϵ Virginis, $\delta=11^\circ 29'$				20 Can. Ven., $\delta=41^\circ 5'$			
Factors	A=+0.46	a=-.08	B=+0.91	b=+.02	A=-0.06	a=-.08	B=+1.32	b=+.03
	C=+1.02	c=-.35			C=+1.32	c=-.35		
Wires.	Chron. T.				Chron. T.			
	h.	m.	s.		h.	m.	s.	
1	12	55	38.9		13	11	25.9	
2			43.4				31.9	
3			48.1				38.2	
4			52.5				43.6	
5			57.1				49.3	
6	56		1.7				55.3	
7			6.1		12		1.4	
Mean	12	55	52.54		13	11	43.66	
Rate			-.30				-.33	
Aber.			-.02				-.02	
δB			+.02				+.04	
RA	12	55	52.24		13	11	43.35	
	12	57	20.45		13	13	11.49	
1st App.	+1	28.21			+1	28.14		
cC		-.36				-.46		
Cor.+aA	1	28.57			1	28.60		
aA		-.04				+.01		
Slow	1	28.61			1	28.59		

APRIL 4, 1902, MACCONNEL, ST. LOUIS—Continued.

Computations.

"c"

Star	Clamp West. 1st App.	C	Star	Clamp East. 1st App.	C
	m. s.			m. s.	
ϵ Leo.	+1 28.83	+1.09	β Leo.	+1 28.14	+1.04
μ Leo.	28.86	1.11	β C. V.	.04	1.35
α Leo.	28.82	1.03	α C. V.	.09	1.29
λ U. M.	29.08	1.38	ϵ Vir.	.21	1.02
β L. M.	29.21	1.25	20 C. V.	.14	1.32
	<hr/>		•	<hr/>	
Mean	1 28.96	1.17	Mean	1 28.12	1.24

$$c = \frac{(1^m \ 28^s.96) - (1^m \ 28^s.12)}{1.17 + 1.24}$$

$$c = +0.35 \text{ Clamp West.}$$

$$c = -0.35 \text{ Clamp East.}$$

Star.	"a"		A	
	Cor. + aA			
	m.	s.		
ϵ Leo.	+1	28.45	+0.27	
μ Leo.		.47	+0.23	
α Leo.		.46	+0.45	
λ U. M.		.60	-0.12	
β L. M.		.77	+0.02	
β Leo.		.50	+0.41	
β C. V.		.51	-0.07	
α C. V.		.54	-0.02	
ϵ Vir.		.57	+0.46	
20 C. V.		.60	-0.06	
Mean	+1	28.55	+0.16	$a = -0.39$
1 Drac.	+1	28.94	-4.77	4.93
Diff.	-	0.39	+4.93	$a = -0.08$

Chronometer corrections.

	m.	s.
ϵ Leonis slow	1	28.47
μ Leonis slow		.49
α Leonis slow		.50
λ Ursae Maj. slow		.59
β Leo. Min slow		.77
β Leonis slow		.53
β Can. Ven. slow		.50
α Can. Ven. slow		.54
ϵ Virginis slow		.61
20 Can. Ven. slow		.59

Mean slow 1 28.56 Epoch of exchange.

THE ONE HUNDREDTH MERIDIAN.

APRIL 4, 1902, MACCONNEL, ST. LOUIS—Continued.

Exchange signals received at St. Louis.

From Red River.			From St. Louis.						From Red River.			From St. Louis.		
h.	m.	s.	h.	m.	s.				h.	m.	s.	h.	m.	s.
11	17	34.90	11	21	0.66				11	18	10.94	11	21	36.93
		36.99			2.70						12.99			38.86
		38.90			4.96						14.98			40.87
		40.90			7.05						16.99			42.93
		42.92			9.00						18.98			45.30
		44.91			9.09						20.95			47.03
		46.97			13.00						22.97			49.00
		48.91			15.00						24.98			51.04
		50.92			17.00						26.97			52.93
		52.90			19.00						28.99			55.02
		54.97			21.01						30.96			56.92
		56.93			23.11						32.90			58.81
		58.99			25.06									
18		0.97			27.04	Mean	11	18	3.95			11	21	29.91
		2.93			29.00	Chr. slow		+1	28.56				+1	28.56
		4.92			31.08									
		6.98			33.02	Correct	11	19	32.51			11	22	58.47
		8.98			34.98									

APRIL 4, 1902, KIDDER, RED RIVER.

Levels.

CLAMP WEST.

9 ^h 0 ^m			10 ^h 45 ^m		
	Dir.	Rev.		Dir.	Rev.
W.	50.0	12.6		51.5	11.0
E.	16.1	46.8		15.0	47.7
W.	50.7	12.6		53.0	9.7
E.	16.1	46.9		16.0	46.5
Sum	132.9	118.9		135.5	114.9
Diff.	+14.0			+20.6	
$\frac{1}{2}$	1.75			2.57	
d	0°.111			0°.111	
b	+0.19			+0.29	

CLAMP EAST.

11 ^h 30 ^m			13 ^h 5 ^m		
	Dir.	Rev.		Dir.	Rev.
W.	50.8	10.5		51.7	9.4
E.	13.8	47.8		13.7	47.5
W.	52.5	9.5		53.0	9.3
E.	15.0	46.8		15.0	47.5
Sum	132.1	114.6		133.4	113.7
Diff.	+17.5			+19.7	
$\frac{1}{2}$	2.20			2.46	
d	0°.111			0°.111	
b	+0.24			+0.27	

APRIL 4, 1902, KIDDER, RED RIVER—Continued.

Clamp West.

Star	1 Draconis, $\delta=81^\circ 46'$			ϵ Leonis, $\delta=24^\circ 14'$		
Factors	A=-5.13	a=+.52		A=+0.20	a=+.52	
	B=+4.73	b=+.20		B=+1.09	b=+.21	
	C=+6.98	c=+.26		C=+1.10	c=+.26	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	16	18.5	9	37	40.9
2		18	52.5		38	4.9
3		21	24.1			28.8
4		24	1.4			53.5
5		26	32.2		39	17.1
Mean	9	21	25.74	9	38	29.04
Aber.			-.15			-.02
bB			+.95			+.28
RA	9	21	26.54	9	38	29.25
	9	23	15.61	9	40	19.65
1st App.	+1	49.07		+1	50.40	
cC		+1.79			+.28	
Cor.+aA	1	47.28		1	50.12	
aA					+.11	
Slow				1	50.01	
Star	μ Leonis, $\delta=26^\circ 28'$			α Leonis, $\delta=12^\circ 27'$		
Factors	A=+0.16	a=+.52		A=+0.38	a=+.52	
	B=+1.10	b=+.23		B=+1.03	b=+.24	
	C=+1.11	c=+.26		C=+1.04	c=+.26	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	44	34.2	10	0	35.5
2			58.8			58.2
3		45	22.9		1	20.3
4			48.2			43.6
5		46	12.2		2	5.5
Mean	9	45	23.26	10	1	20.62
Aber			-.02			-.02
bB			+.25			+.25
RA	9	45	23.49	10	1	20.85
	9	47	13.75	10	3	11.51
1st App	+1	50.26		1	50.66	
cC		+1.28			+.27	
Cor.+aA	1	49.98		1	50.37	
aA		+1.08			+.20	
Slow	1	49.90		1	50.19	

APRIL 4, 1902, KIDDER, RED RIVER—Continued.

Star	λ Ursae Maj., $\delta=43^\circ 24'$			β Leo. Min., $\delta=37^\circ 13'$		
Factors	A=-0.22 a=+.52 B=+1.36 b=+.26 C=+1.38 c=+.26			A=-0.06 a=+.52 B=+1.25 b=+.27 C=+1.25 c=+.26		
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	10	8	23.1	10	19	29.8
2			53.5			57.7
3		9	23.1		20	24.7
4			54.0			53.1
5		10	23.9		21	20.1
Mean	10	9	23.52	10	20	25.08
Aber.			-.02			-.02
δB			+.35			+.34
RA	10	9	23.85	10	20	25.40
	10	11	13.92	10	22	15.62
1st App.		+1	50.07		+1	50.22
cC			+.35			+.32
Cor.+aA		1	49.72		1	49.90
aA			-.12			-.03
Slow		1	49.84		1	49.93

Clamp East.

Star	β Leonis, $\delta=15^\circ 7'$			4 Draconis, $\delta=78^\circ 10'$		
Factors	A=+0.34 a=+.45 B=+0.98 b=+.24 C=+1.04 c=-.26			A=-3.37 a=+.45 B=+3.53 b=+.24 C=+4.88 c=-.26		
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	11	41	30.8	12	2	20.9
2			53.1		4	5.6
3		42	16.4		5	55.4
4			38.9		7	40.0
5		43	1.4		9	27.4
Mean	11	42	16.12	12	5	53.86
Aber.			-.02			-.09
δB			+.24			+.85
RA	11	42	16.34	12	5	54.62
	11	44	6.20	12	7	41.82
1st App.		+1	49.86		+1	47.20
cC			-.27			-1.25
Cor.+aA		1	50.13		1	48.45
aA			+.15			
Slow		1	49.98			

APRIL 4, 1902, KIDDER, RED RIVER—Continued.

Star	β Can. Ven., $\delta=41^{\circ} 53'$				α Can. Ven., $\delta=38^{\circ} 51'$			
Factors	A=-0.17		a=+.45		A=-0.10		a=+.45	
	B=+1.32		b=+.25		B=+1.28		b=+.26	
	C=+1.34		c=-.26		C=+1.29		c=-.26	
Wires.	Chron. T.				Chron. T.			
	h.	m.	s.		h.	m.	s.	
1	12	26	19.3		12	48	43.1	
2			48.4			49	10.9	
3		27	18.5				40.0	
4			47.4			50	7.5	
5		28	17.2				35.8	
Mean	12	27	18.16		12	49	39.46	
Aber.			-.02				-.02	
bB			+.33				+.33	
RA	12	27	18.47		12	49	39.77	
	12	29	8.02		12	51	29.20	
1st App.	+1		49.55		+1		49.43	
cC			-.34				-.33	
Cor.+aA	1		49.89		1		49.76	
aA			-.08				-.05	
Slow	1		49.97		1		49.81	

Star	ϵ Virginis, $\delta=11^{\circ} 29'$				20 Can. Ven., $\delta=41^{\circ} 5'$			
Factors	A=+0.40		a=+.45		A=-0.16		a=+.45	
	B=+0.94		b=+.27		B=+1.32		b=+.27	
	C=+1.02		c=-.26		C=+1.32		c=-.26	
Wires.	Chron. T.				Chron. T.			
	h.	m.	s.		h.	m.	s.	
1	12	54	45.7		13	10	23.6	
2		55	7.4				51.8	
3			30.6			11	21.9	
4			52.6				50.8	
5		56	15.0			12	19.9	
Mean	12	55	30.26		13	11	21.60	
Aber.			-.02				-.02	
bB			+.25				+.35	
RA	12	55	30.49		13	11	21.93	
	12	57	20.45		12	13	11.49	
1st App.	+1		49.96		+1		49.56	
cC			-.26				-.34	
Cor.+aA	1		50.22		1		49.90	
aA			+.18				-.07	
Slow	1		50.04		1		49.77	

APRIL 4, 1902, KIDDER, RED RIVER—Continued.

Computations.

"c"

Star.	Clamp West. 1st App.	C.	Star.	Clamp East. 1st App.	C.
	m. s.			m. s.	
ε Leo.	+1 50.40	+1.10	β Leo.	+1 49.86	+1.04
μ Leo.	.26	1.11	β C. V.	.55	1.34
α Leo.	.66	1.04	α C. V.	.43	1.29
λ U. M.	.07	1.38	ε Vir.	.96	1.02
β L. M.	.22	1.25	20 C. V.	.56	1.32
Mean	+1 50.32	+1.18	Mean	+1 49.67	+1.20

$$c = \frac{(1^m 50^s 32) - (1^m 49^s 67)}{1.18 + 1.20}$$

$$c = +0.26 \text{ Clamp West.}$$

$$c = -0.26 \text{ Clamp East.}$$

"a"

Star.	Clamp West. Cor.+aA	A.	Star.	Clamp East. Cor.+aA	A.
	m. s.			m. s.	
ε Leo.	+1 50.12	+0.20	β Leo.	+1 50.13	+0.34
μ Leo.	49.98	+0.16	β C. V.	49.89	-0.17
α Leo.	50.39	+0.38	α C. V.	49.76	-0.10
λ U. M.	49.72	-0.22	ε Vir.	50.22	+0.40
β L. M.	49.90	-0.06	20 C. V.	49.90	-0.16
Mean	+1 50.02	+0.09	Mean	+1 49.98	+0.06
1 Drac.	+1 47.28	-5.13	4 Drac.	+1 48.45	-3.37
Diff.	+2.74	+5.22	Diff.	+1.53	+3.43

$$a = \frac{+2.74}{5.22}$$

$$a = +0.52$$

$$a = \frac{+1.53}{3.43}$$

$$a = +0.45$$

Chronometer corrections.

	m.	s.
ε Leonis slow	1	50.01
μ Leonis slow		49.90
α Leonis slow		50.19
λ Ursæ Maj. slow		49.84
β Leo. Min. slow		49.93
β Leonis slow		49.98
β Can. Ven. slow		49.97
α Can. Ven. slow		49.81
ε Virginis slow		50.04
20 Can. Ven. slow		49.97

Mean slow 1 49.97 Epoch of exchange.

APRIL 4, 1902, KIDDER, RED RIVER—Continued.

Exchange signals received at Red River.

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
10	38	1.42	10	41	27.30	10	38	39.50	10	42	5.50	
		3.50			29.40			41.48			7.50	
		5.45			31.60			43.49			9.55	
		7.40			33.68			45.50			11.83	
		9.45			35.60			47.50			13.70	
		11.48			37.70			49.49			15.65	
		13.50			39.62			51.48			17.60	
		15.44			41.63			53.48			19.60	
		17.45			43.70			55.50			21.68	
		19.44			45.60			57.48			23.60	
		21.48			47.60			59.42			25.44	
		23.48			49.78							
		25.50			51.68	Mean	10	38	30.47	10	41	56.61
		27.45			53.68	Chr. slow	+1	49.97		+1	49.97	
		29.44			55.62							
		31.42			57.70	Correct	10	40	20.44	10	43	46.58
		33.48			59.68	St. Louis	11	19	32.51	11	22	58.47
		35.47	42		1.60							
		37.45			3.55	Diff.	39	12.07		39	11.89	
Mean 39 ^m 11 ^s .98, St. Louis to Red River, April 4, 1902.												

Mean 39^m 11^s.98, St. Louis to Red River, April 4, 1902.

APRIL 6, 1902, MACCONNEL, ST. LOUIS.

Levels.

CLAMP EAST.

	9 ^h 0 ^m			10 ^h 50 ^m	
	W.	E.		W.	E.
Dir.	9.0	6.3		9.8	6.0
Rev.	5.4	10.2		4.2	11.2
Rev.	5.5	10.0		4.0	11.4
Dir.	10.4	5.0		9.3	6.2
Sum.	30.3	31.5		27.3	34.8
Diff.	-1.2			-7.5	
$\frac{1}{s}$	0.15			0.94	
d	0 ^s .136			0 ^s .136	
b	-0.02			-0.13	

CLAMP WEST.

	11 ^h 30 ^m			13 ^h 20 ^m	
	W.	E.		W.	E.
Dir.	8.5	7.2		10.1	6.2
Rev.	4.9	10.8		6.9	9.7
Rev.	5.2	10.6		6.8	9.8
Dir.	8.1	7.7		10.4	6.3
Sum.	26.7	36.3		34.2	32.0
Diff.	-9.6			+2.2	
$\frac{1}{s}$	1.20			0.28	
d	0 ^s .136			0 ^s .136	
b	-0.16			+0.04	

APRIL 6, 1902, MACCONNEL, ST. LOUIS—Continued.

Clamp East.

Star	1 Draconis, $\delta=81^\circ 46'$	ϵ Leonis, $\delta=24^\circ 14'$
Factors	Lost, clouds.	$A=+0.27$ $a=-.28$ $B=+1.06$ $b=-.03$ $C=+1.09$ $c=-.29$
Wires.		Chron. T.
1		h. m. s. h. m. s.
2		9 38 44.1=9 38 58.9
3		49.0= 58.8
4		54.1= 58.9
5		Lost.
6		39 3.9= 58.8
7		8.7= 58.7
		Lost.
Mean		9 38 58.82
Rate		+.19
Aber.		-.02
bB		-.03
RA		9 38 58.96
		9 40 19.63
1st App.		+1 20.67
cC		-.32
Cor.+aA		1 20.99
aA		-.08
Slow		1 21.07
Star	μ Leonis, $\delta=26^\circ 25'$, lost, clouds.	α Leonis, $\delta=12^\circ 27'$, lost, clouds.
Star	β Leo. Min., $\delta=37^\circ 13'$	46 Leo. Min., $\delta=34^\circ 44'$
Factors	$A=+0.02$ $a=-.28$ $B=+1.25$ $b=-.08$ $C=+1.25$ $c=-.29$	$A=+0.08$ $a=-.28$ $B=+1.21$ $b=-.13$ $C=+1.22$ $c=-.29$
Wires.	Chron. T.	Chron. T.
1	h. m. s.	h. m. s.
2	10 20 38.0	10 46 15.5
3	43.7	21.1
4	49.4	26.4
5	54.9	31.8
6	21 0.5	37.3
7	6.1	42.8
	11.8	48.1
Mean	10 20 54.91	10 46 31.86
Rate	+.09	+.03
Aber.	-.02	-.02
bB	-.10	-.16
RA	10 20 54.88	10 46 31.71
	10 22 15.59	10 47 52.46
1st App.	+1 20.71	+1 20.75
cC	-.36	-.36
Cor.+aA	1 21.07	1 21.11
aA	-.01	-.02
Slow	1 21.08	1 21.13

APRIL 6, 1902, MACCONNEL, ST. LOUIS—Continued.

Clamp West.

Star	β Leonis, $\delta=15^{\circ} 7'$	4 Draconis, $\delta=78^{\circ} 10'$
Factors	A=+0.41 a=−.28 B=+0.95 b=−.12 C=+1.04 c=+.29	A=−3.11 a=−.28 B=+3.76 b=−.09 C=+4.88 c=+.29
Wires.	Chron. T. h. m. s.	Chron. T. h. m. s.
1	11 42 31.5	12 5 13.3
2	36.0	35.8
3	40.6	57.3
4	45.3	6 19.0
5	49.8	40.4
6	54.4	7 2.2
7	59.3	24.6
Mean	11 42 45.27	12 6 18.94
Rate	−.11	−.16
Aber.	−.02	−.07
bB	−.11	−.34
RA	11 42 45.03 11 44 6.19	12 6 18.37 12 7 41.78
1st App. cC	+1 21.16 +.30	+1 23.41 +1.41
Cor.+aA aA	1 20.96 −.12	1 22.00
Slow	1 21.08	

Star	β Can. Ven., $\delta=41^{\circ} 53'$	α Can. Ven., $\delta=38^{\circ} 51'$
Factors	A=−0.07 a=−.28 B=+1.34 b=−.06 C=+1.35 c=+.29	A=−0.02 a=−.28 B=+1.29 b=−.03 C=+1.29 c=+.29
Wires.	Chron. T. h. m. s.	Chron. T. h. m. s.
1	12 27 28.8	12 49 50.8
2	34.9	56.3
3	40.4	50 2.1
4	46.7	8.3
5	52.5	13.7
6	58.8	19.4
7	28 4.9	25.3
Mean	12 27 46.74	12 50 7.99
Rate	−.23	−.27
Aber.	−.02	−.02
bB	−.08	−.04
RA	12 27 46.41 12 29 8.03	12 50 7.66 12 51 29.20
1st App. cC	+1 21.62 +.39	+1 21.54 +.38
Cor.+aA aA	1 21.23 +.02	1 21.16 +.01
Slow	1 21.21	1 21.15

APRIL 6, 1902, MACCONNEL, ST. LOUIS—Continued.

Star	ε Virginis, $\delta=11^{\circ} 29'$			20 Can. Ven., $\delta=41^{\circ} 5'$		
Factors	A=+0.46	a=−.28		A=−0.06	a=−.28	
	B=+0.91	b= .00		B=+1.32	b=+.03	
	C=+1.02	c=+.29		C=+1.32	c=+.29	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	12	55	45.9	13	11	32.3
2			50.6			38.5
3			54.9			44.4
4			59.6			50.3
5	56		4.2			56.1
6			8.7	12		2.4
7			13.2			8.2
Mean	12	55	59.59	13	11	50.31
Rate			−.30			−.33
Aber.			−.02			−.02
bB			−.00			+.04
RA	12	55	59.27	13	11	50.00
	12	57	20.46	13	13	11.51
1st App.	+1		21.19	+1		21.51
cC			+.30			+.39
Cor.+aA	1		20.89	1		21.12
aA			−.13			+.02
Slow	1		21.02	1		21.10

Computations.

"c"

Star.	Clamp East.		C.	Star.	Clamp West.		C.
	1st App.				1st App.		
	m.	s.			m.	s.	
ε Leo.	+1	20.67	+1.09	β Leo.	+1	21.16	+1.04
β L. M.		.71	1.25	β C. V.		.62	1.35
46 L. M.		.75	1.22	α C. V.		.54	1.29
				ε Vir.		.19	1.02
				20 C. V.		.51	1.32
Mean	+1	20.71	+1.19	Mean	+1	21.40	+1.24

$$c = \frac{(1^m 20^s.71) - (1^m 21^s.40)}{1.19 + 1.24}$$

$$c = -0.29 \quad \text{Clamp East.}$$

$$c = +0.29 \quad \text{Clamp West.}$$

"a"

Star.	Cor. +aA		A
	m.	s.	
ε Leo.	+1	20.99	+0.27
β L. M.		21.07	+0.02
46 L. M.		21.11	+0.08
β Leo.		20.96	+0.41
β C. V.		21.23	−0.07
α C. V.		21.16	−0.02
ε Vir.		20.89	+0.46
20 C. V.		21.12	−0.06
Mean	+1	21.07	+0.14
4 Drac.	+1	22.00	−3.11
Diff.		−0.93	+3.25

$$a = -\frac{.93}{3.25}$$

$$a = -0.28$$

APRIL 6, 1902, MACCONNEL, ST. LOUIS—Continued.

Chronometer corrections.

	m.	s."
ϵ Leonis slow	+1	21.07
β Leo. Min. slow		.08
46 Leo. Min. slow		.13
β Leonis slow		.08
β Can. Ven. slow		.21
α Can. Ven. slow		.15
ϵ Virginis slow		.02
20 Can. Ven. slow		.10

Mean slow 1 21.11 Epoch of exchange.

Exchange signals received at St. Louis.

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
11	5	40.90	11	10	0.85	11	6	16.90	11	10	37.06	
		42.90			2.90			18.94			39.09	
		44.88			5.08			20.94			41.11	
		46.90			7.18			22.96			43.10	
		48.90			9.10			24.94			45.20	
		50.90			11.08			26.98			47.20	
		52.98			13.00			28.95			49.20	
		54.91			15.00			30.94			51.18	
		56.90			16.92			32.85			53.00	
		58.98			19.00			34.91			54.95	
6	0.93				21.10			36.90			56.80	
		2.87			22.98			38.80			59.00	
		5.08			25.08							
		6.90			26.99	Mean	11	6	9.92	11	10	30.04
		8.90			29.00	Chr. slow	+1	21.11		+1	21.11	
		10.90			31.00							
		12.91			33.00	Correct	11	7	31.03	11	11	51.15
		14.90			34.98							

APRIL 6, 1902, KIDDER, RED RIVER.

Levels.

CLAMP WEST.

	9 ^h	0 ^m		10 ^h	45 ^m
	Dir.	Rev.		Dir.	Rev.
W	49.2	13.5		51.5	12.5
E	15.3	47.8		16.3	48.0
W	50.7	12.6		51.6	12.5
E	16.0	47.0		16.1	48.0
Sum	131.2	120.9		135.5	121.0
Diff.		+10.3			+14.5
$\frac{1}{8}$		1.29			1.81
d		0 ^o .111			0 ^o .111
b		+0.14			+0.20

CLAMP EAST.

	11 ^h	30 ^m		13 ^h	5 ^m
	Dir.	Rev.		Dir.	Rev.
W	50.8	12.6		51.7	11.3
E	14.9	48.8		14.5	48.5
W	51.4	12.5		53.0	10.4
E	15.0	48.8		16.5	47.6
Sum	132.1	122.7		135.7	117.8
Diff.		+9.4			+17.9
$\frac{1}{8}$		1.18			2.24
d		0 ^o .111			0 ^o .111
b		+0.13			+0.25

APRIL 6, 1902, KIDDER, RED RIVER—Continued.

Clamp West.

Star	1 Draconis, $\delta=81^\circ 46'$	ϵ Leonis, $\delta=24^\circ 14'$
Factors	$A=-5.13$ $a=+.56$ $B=+4.73$ $b=+.14$ $C=+6.98$ $c=+.30$	$A=+0.20$ $a=+.56'$ $B=+1.09$ $b=+.15$ $C=+1.10$ $c=+.30$
Wires.	Chron. T.	Chron. T.
	h. m. s. h. m. s.	h. m. s.
1	9 16 20.8 = 9 21 27.4	9 37 42.2
2	18 55.0 = 28.0	38 6.5
3	21 25.0 = 26.8	30.3
4	Lost	54.9
5	26 32.2 = 26.4	39 18.3
Mean	9 21 27.15	9 38 30.44
Aber.	— .15	— .02
bB	+ .67	+ .16
RA	9 21 27.67	9 38 30.58
	9 23 15.38	9 40 19.63
1st App.	+1 47.71	+1 49.05
cC	+2.11	+ .33
Cor.+aA	1 45.60	1 48.72
aA		+ .11
Slow		1 48.61
Star	μ Leonis, $\delta=26^\circ 28'$	α Leonis, $\delta=12^\circ 27'$
Factors	$A=+0.16$ $a=+.56$ $B=+1.10$ $b=+.16$ $C=+1.11$ $c=+.30$	$A=+0.38$ $a=+.56$ $B=+1.03$ $b=+.17$ $C=+1.04$ $c=+.30$
Wires.	Chron. T.	Chron. T.
	h. m. s. h. m. s.	h. m. s.
1	9 44 35.4	10 0 37.3
2	45 0.3	59.8
3	24.3	1 22.1
4	49.7	45.1
5	46 13.6	2 7.2
Mean	9 45 24.66	10 1 22.30
Aber.	— .02	— .02
bB	+ .18	+ .18
RA	9 45 24.82	10 1 22.46
	9 47 13.73	10 3 11.48
1st App.	+1 48.91	+1 49.02
cC	+ .33	+ .31
Cor.+aA	1 48.58	1 48.71
aA	+ .09	+ .21
Slow	1 48.49	1 48.50

APRIL 6, 1902, KIDDER, RED RIVER—Continued.

Star	λ U. M., $\delta=43^{\circ} 24'$			β L. M., $\delta=37^{\circ} 13'$			41 L. M., $\delta=23^{\circ} 42'$		
Factors	A=-0.22	a=+.56		A=-0.06	a=+.56		A=+0.19	a=+.56	
	B=+1.36	b=+.18		B=+1.25	b=+.19		B=+1.08	b=+.20	
	C=+1.38	c=+.30		C=+1.25	c=+.30		C=+1.09	c=+.30	
Wires.	Chron. T.			Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.	h.	m.	s.
1	10	8	24.7	10	19	31.3	10	35	30.5
2			54.6			59.2			54.7
3		9	24.7		20	26.1		36	18.3
4			55.3			54.6			42.7
5		10	25.4		21	21.6		37	6.4
Mean	10	9	24.94	10	20	26.56	10	36	18.52
Aber.			-.02			-.02			-.02
bB			+.24			+.24			+.22
RA	10	9	25.16	10	20	26.78	10	36	18.72
	10	11	13.88	10	22	15.59	10	38	7.73
1st App.		+1	48.72		+1	48.81		+1	49.01
cC			+.42			+.38			+.33
Cor.+aA		1	48.30		1	48.43		1	48.68
aA			-.12			-.03			+.11
Slow		1	48.42		1	48.46		1	48.57

Clamp East.

Sta.	β Leonis, $\delta=15^{\circ} 07'$			4 Draconis, $\delta=78^{\circ} 10'$		
Factors	A=+0.34	a=+.55		A=-3.37	a=+.55	
	B=+0.98	b=+.15		B=+3.53	b=+.17	
	C=+1.04	c=-.30		C=+4.88	c=-.30	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	11	41	32.6	12	2	22.5
2			54.4		4	7.5
3		42	17.4		5	57.7
4			40.1		7	43.1
5		43	3.2		9	29.7
Mean	11	42	17.54	12	5	56.10
Aber.			-.02			-.09
bB			+.15			+.60
RA	11	42	17.67	12	5	56.61
	11	44	6.19	12	7	41.78
1st App.		+1	48.52		+1	45.17
cC			-.31			-1.48
Cor.+aA		1	48.83		1	46.65
aA			+.19			
Slow		1	48.64			

APRIL 6, 1902, KIDDER, RED RIVER—Continued.

Star	β Can. Ven., $\delta=41^\circ 53'$			α Can. Ven., $\delta=38^\circ 51'$		
Factors	A=-0.17	a=+.55		A=-0.10	a=+.55	
	B=+1.32	b=+.19		B=+1.28	b=+.21	
	C=+1.34	c=-.30		C=+1.29	c=-.30	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	12	26	20.8	12	48	44.6
2			50.1	49		12.2
3		27	20.2			41.2
4			49.3	50		9.1
5		28	18.8			37.3
Mean	12	27	19.84	12	49	40.88
Aber.			-.02			-.02
bB			+.25			+.27
RA	12	27	20.07	12	49	41.13
	12	29	8.03	12	51	29.20
1st App.	+1		47.98	+1		48.07
cC			-.40			-.39
Cor.+aA	1		48.38	1		48.46
aA			-.09			-.05
Slow	1		48.47	1		48.51
Star	ϵ Virginis, $\delta=11^\circ 29'$			20 Can. Ven., $\delta=41^\circ 5'$		
Factors	A=+0.40	a=+.55		A=-0.16	a=+.55	
	B=+0.94	b=+.23		B=+1.32	b=+.25	
	C=+1.02	c=-.30		C=+1.32	c=-.30	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	12	54	47.3	13	10	25.2
2		55	9.0			53.8
3			32.2	11		23.4
4			54.1			52.3
5		56	16.6	12		21.5
Mean	12	55	31.84	13	11	23.24
Aber.			-.02			-.02
bB			+.25			+.33
RA	12	55	32.07	13	11	23.55
	12	57	20.46	13	13	11.51
1st App.	+1		48.39	+1		47.96
cC			-.31			-.40
Cor.+aA	1		48.70	1		48.36
aA			-.22			-.09
Slow	1		48.48	1		48.45

APRIL 6, 1902, KIDDER, RED RIVER—Continued.

Computations.

"c"					
Star.	Clamp West. 1st App. m. s.	C.	Star.	Clamp East. 1st App. m. s.	C.
ϵ Leo.	+1 48.05	+1.10	β Leo.	+1 48.52	+1.04
μ Leo.	48.91	1.11	β C. V.	47.98	1.34
α Leo.	49.02	1.04	α C. V.	48.07	1.29
λ U. M.	48.72	1.38	ϵ Vir.	48.39	1.02
β L. M.	48.81	1.25	20 C. V.	47.96	1.32
Mean	1 48.90	1.18	Mean	1 48.18	1.20

$$c = \frac{(1^m 48^s.90) - (1^m 48^s.18)}{1.18 + 1.20}$$

$$c = +0.30 \text{ Clamp West.}$$

$$c = -0.30 \text{ Clamp East.}$$

"a"					
Clamp West. Cor. aA			Clamp East. Cor. aA		
m.	s.	A.	Star.	m.	s.
ϵ Leo.	+1 48.72	+0.20	β Leo.	+1 48.83	+0.34
μ Leo.	.58	+0.16	β C. V.	.38	-0.17
α Leo.	.71	+0.38	α C. V.	.46	-0.10
λ U. M.	.30	-0.22	ϵ Vir.	.70	+0.40
β L. M.	.43	-0.06	20 C. V.	.36	-0.16
Mean	+1 48.55	+0.09	Mean	+1 48.54	+0.06
1 Drac.	1 45.60	-5.13	4 Drac.	1 46.65	-3.37
Diff.	+2.95	+5.22	Diff.	+1.89	+3.43

$$a = \frac{+2.95}{5.22}$$

$$a = +0.56$$

$$a = \frac{+1.89}{3.43}$$

$$a = +0.55$$

Chronometer corrections.

	m.	s.
ϵ Leonis slow	1	48.61
μ Leonis slow		.49
α Leonis slow		.50
λ Ursæ Maj. slow		.42
β Leo. Min. slow		.46
41 Leo. Min. slow		.57
β Leonis slow		.64
β Can. Ven. slow		.47
α Can. Ven. slow		.51
ϵ Virginis slow		.48
20 Can. Ven. slow		.45

Mean slow 1 48.51 At exchange.

APRIL 6, 1902, KIDDER, RED RIVER—Continued.

Exchange signals received at Red River.

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
10	26	1.46	10	30	21.53	10	26	39.49	10	30	59.78	
		3.50			23.58			41.48		31	1.80	
		5.44			25.70			43.50			3.80	
		7.49			27.84			45.50			5.90	
		9.45			29.78			47.52			7.90	
		11.46			31.75			49.50			9.90	
		13.52			33.70			51.50			11.83	
		15.48			35.65			53.50			13.70	
		17.47			37.60			55.50			15.62	
		19.50			39.67			57.48			17.50	
		21.48			41.75			59.34			19.70	
		23.45			43.62							
		25.48			45.72	Mean	10	26	30.48	10	30	50.71
		27.45			47.63	Chr. slow	+ 1	48.51	+ 1	48.51		
		29.45			49.68							
		31.45			51.67	Correct	10	28	18.99	10	32	39.22
		33.50			53.65	St. Louis	11	7	31.03	11	11	51.15
		35.48			55.63							
		37.48			57.78	Diff.	39	12.04	39	11.93		
Mean 39 ^m 11 ^s . 985, St. Louis to Red River, April 6, 1902.												

Mean 39^m 11^s. 985, St. Louis to Red River, April 6, 1902.

APRIL 7, 1902, MACCONNEL, ST. LOUIS.

Levels.

CLAMP WEST.

	W.	9 ^h 30 ^m	E.	W.	10 ^h 30 ^m	E.
Dir.	9.5		9.8	9.0		10.9
Rev.	9.4		9.9	10.4		9.8
Rev.	10.2		9.0	11.4		8.9
Dir.	9.5		8.7	7.6		12.9
Sum	38.6		37.4	38.4		42.5
Diff.		+1.2			-4.1	
$\frac{1}{s}$		0.15			0.51	
d		0°.136			0°.136	
b		+0.02			-0.07	

CLAMP EAST.

	W.	11 ^h 30 ^m	E.	W.	13 ^h 15 ^m	E.
Dir.	8.7		12.2	7.4		14.9
Rev.	12.5		9.0	13.8		8.7
Rev.	12.5		9.0	14.1		8.2
Dir.	7.7		13.9	8.7		13.8
Sum	41.4		44.1	44.0		45.6
Diff.		-2.7			-1.6	
$\frac{1}{s}$		0.34			0.2	
d		0°.136			0°.136	
b		-0.05			-0.03	

APRIL 7, 1902, MACCONNEL, ST. LOUIS—Continued.

Clamp West.

Star	1 Draconis, $\delta=81^{\circ} 46'$			ε Leonis, $\delta=24^{\circ} 14'$		
Factors	A=-4.77	a=-.27		A=+.27	a=-.27	
	B=+5.09	b=+.02		B=+1.06	b=+.01	
	C=+6.98	c=+.29		C=+1.09	c=+.29	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	20	20.7	9	38	46.8
2			51.6			52.4
3		21	23.6			57.0
4			54.4	39		1.8
5		22	26.3			6.9
6			56.2			11.5
7		23	28.0			16.8
Mean	9	21	54.40	9	39	1.89
Rate			+.24			+.19
Aber.			-.11			-.02
bB			+.10			+.01
RA	9	21	54.63	9	39	2.07
	9	23	15.26	9	40	19.62
1st App.	+1		20.63	+1		17.55
cC			+2.06			+.32
Cor.+aA	1		18.57	1		17.23
aA						-.07
Slow				1		17.30
Star	μ Leonis, $\delta=26^{\circ} 25'$			α Leonis, $\delta=12^{\circ} 27'$		
Factors	A=+0.23	a=-.27		A=+0.45	a=-.27	
	B=+1.09	b=-.01		B=+0.92	b=-.03	
	C=+1.11	c=+.29		C=+1.03	c=+.29	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	9	45	40.9	10	1	40.0
2			46.0			44.7
3			51.3			49.2
4			56.1			53.7
5		46	1.3			58.5
6			6.1	2		3.0
7			11.1			7.9
Mean	9	45	56.11	10	1	53.86
Rate			+.18			+.15
Aber.			-.02			-.02
bB			-.01			-.03
RA	9	45	56.26	10	1	53.96
	9	47	13.72	10	3	11.47
1st App.	+1		17.46	+1		17.51
cC			+.33			+.30
Cor.+aA	1		17.13	1		17.21
aA			-.06			-.12
Slow	1		17.19	1		17.33

APRIL 7, 1902, MACCONNEL, ST. LOUIS—Continued.

Star	λ Ursae Maj., $\delta=43^{\circ} 24'$			β Leo. Min., $\delta=37^{\circ} 13'$		
Factors	A=-0.12	a=-.27		A=+0.02	a=-.27	
	B=+1.37	b=-.05		B=+1.25	b=-.07	
	C=+1.38	c=+.29		C=+1.25	c=+.29	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	10	9	37.5	10	20	41.2
2			43.9			46.8
3			49.9			52.1
4			56.0			58.2
5	10		2.0			3.4
6			8.8			9.3
7			14.6			15.0
Mean	10	9	56.10	10	20	58.00
Rate			+.12			+.09
Aber.			-.02			-.02
bB			-.07			-.09
RA	10	9	56.13	10	20	57.98
	10	11	13.87	10	22	15.58
1st App.	+1		17.74	+1		17.60
cC			+.41			+.37
Cor.+aA	1		17.33	1		17.23
aA			+.03			-.00
Slow	1		17.30	1		17.23

Clamp East.

Star	β Leonis, $\delta=15^{\circ} 7'$			γ Draconis, $\delta=78^{\circ} 10'$		
Factors	A=+0.41	a=-.45		A=-3.11	a=-.45	
	B=+0.95	b=-.05		B=+3.76	b=-.05	
	C=+1.04	c=-.29		C=+4.88	c=-.29	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	11	42	35.4	12	5	19.9
2			40.5			41.1
3			44.7	6		3.7
4			49.5			24.6
5			54.3			47.7
6			58.7	7		8.0
7	43		3.4			30.4
Mean	11	42	49.50	12	6	24.91
Rate			-.11			-.16
Aber.			-.02			-.07
bB			-.05			-.19
RA	11	42	49.32	12	6	24.49
	11	44	6.19	12	7	41.75
1st App.	+1		16.87	+1		17.26
cC			-.31			-1.44
Cor.+aA	1		17.18	1		18.70
aA			-.18			
Slow	1		17.36			

APRIL 7, 1902, MACCONNEL, ST. LOUIS—Continued.

Star	β Can. Ven., $\delta=41^\circ 53'$	α Can. Ven., $\delta=38^\circ 51'$
Factors	A=-0.07 a=-.45 B=+1.34 b=-.04 C=+1.35 c=-.29	A=-0.02 a=-.45 B=+1.29 b=-.04 C=+1.29 c=-.29
Wires.	Chron. T. h. m. s.	Chron. T. h. m. s.
1	12 27 33.2	12 50 Lost.
2	39.5	1.2
3	45.6	7.0
4	51.9	12.2
5	57.5	18.6
6	28 3.6	24.2
7	9.4	Lost.
Mean	12 27 51.53	12 50 12.64
Rate	-.23	-.27
Aber.	-.02	-.02
bB	-.05	-.05
RA	12 27 51.23 12 29 8.03	12 50 12.30 12 51 29.21
1st App.	+1 16.80	+1 16.91
cC	-.40	-.38
Cor.+aA	1 17.20	1 17.29
aA	+.03	+.01
Slow	1 17.17	1 17.28
Star	ϵ Virginis, $\delta=11^\circ 29'$	20 Can. Ven., $\delta=41^\circ 5'$
Factors	A=+0.46 a=-.45 B=+0.91 b=-.03 C=+1.02 c=-.29	A=-0.06 a=-.45 B=+1.32 b=-.03 C=+1.32 c=-.29
Wires.	Chron. T. h. m. s.	Chron. T. h. m. s.
1	12 55 50.4	13 11 Lost.
2	54.8	43.1
3	59.7	48.3
4	56 4.2	54.9
5	8.7	12 1.2
6	13.3	6.8
7	17.8	Lost.
Mean	12 56 4.13	13 11 54.86
Rate	-.30	-.33
Aber.	-.02	-.02
bB	-.03	-.04
RA	12 56 3.78 12 57 20.46	13 11 54.47 13 13 11.51
1st App.	+1 16.68	+1 17.04
cC	-.30	-.39
Cor.+aA	1 16.98	1 17.43
aA	-.21	+.03
Slow	1 17.19	1 17.40

APRIL 7, 1902, MACCONNEL, ST. LOUIS—Continued.

Computations.

Star.	Clamp W.		C.	"c"		Star.	Clamp E.		C.
	m.	s.					m.	s.	
ϵ Leo.	+1	17.55	+1.09			β Leo.	+1	16.87	+1.04
μ Leo.		.46	1.11			β C. V.		16.80	1.35
α Leo.		.51	1.03			α C. V.		16.91	1.29
λ U. M.		.74	1.38			ϵ Vir.		16.68	1.02
β L. M.		.60	1.25			20 C. V.		17.04	1.32
Mean	1	17.57	1.17			Mean	1	16.86	1.24

$$c = \frac{(1^m 17^s.57) - (1^m 16^s.86)}{1.17 + 1.24}$$

$$c = +0.29 \quad \text{Clamp W.}$$

$$c = -0.29 \quad \text{Clamp E.}$$

Star.	"a"		A	Star.	"a"		A
	m.	s.			m.	s.	
ϵ Leo.	+1	17.23	+0.27	β Leo.	+1	17.18	+0.41
μ Leo.		.13	+0.23	β C. V.		17.20	-0.07
α Leo.		.21	+0.45	α C. V.		17.29	-0.02
λ U. M.		.33	-0.12	ϵ Vir.		16.98	+0.46
β L. M.		.23	+0.02	20 C. V.		17.43	-0.06
Mean	+1	17.23	+0.17	Mean	+1	17.22	+0.14
1 Drac.	1	18.57	-4.77	4 Drac.	1	18.70	-3.11
Diff.	-1.34		+4.94	Diff.	-1.48		+3.25

$$a = \frac{-1.34}{4.94}$$

$$a = -0.27$$

$$a = \frac{-1.48}{3.25}$$

$$a = -0.45$$

Chronometer corrections.

	m.	s.
ϵ Leonis slow	1	17.30
μ Leonis slow		.19
α Leonis slow		.33
λ Ursæ Maj. slow		.30
β Leo. Min. slow		.23
β Leonis slow		.36
β Can. Ven. slow		.17
α Can. Ven. slow		.28
ϵ Virginis slow		.19
20 Can. Ven. slow		.40

Mean slow 1 17.28 Epoch of exchange.

APRIL 7, 1902, MACCONNEL, ST. LOUIS—Continued.

Exchange signals received at St. Louis.

From Red River.			From St. Louis.						From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.		h.	m.	s.	h.	m.	s.	h.	m.	s.
11	2	44.96	11	4	15.20		11	3	20.90	11	4	50.85			
		46.90			16.90				22.99			52.90			
		48.92			18.85				24.97			54.90			
		50.90			20.96				26.98			56.97			
		52.90			23.00				28.98			58.98			
		54.92			25.02				30.96	5		1.06			
		56.99			26.91				32.99			3.10			
		58.90			28.90				35.00			5.00			
3		0.90			30.85				36.90			6.98			
		2.93			32.87				38.90			8.90			
		4.92			34.82				40.93			11.00			
		7.00			36.80				42.80			12.94			
		8.93			38.70										
		10.95			40.72	Mean	11	3	13.94	11	4	43.89			
		12.94			42.80	Chr. slow		+1	17.28		+1	17.28			
		14.93			44.92										
		16.95			46.98	Correct	11	4	31.22	11	6	1.17			
		18.95			48.85										

APRIL 7, 1902, KIDDER, RED RIVER.

Levels.

CLAMP WEST.

	Dir.	9 ^h 5 ^m	Rev.	Dir.	10 ^h 30 ^m	Rev.
W.	49.2		14.2	50.1		13.7
E.	16.7		46.8	16.2		47.7
W.	50.0		14.2	50.8		13.3
E.	17.0		46.9	16.7		47.3
Sum	132.9		122.1	133.8		122.0
Diff.		+10.8			+11.8	
$\frac{1}{2}$		1.35			1.47	
d		0°.111			0°.111	
b		+ 0.15			+ 0.16	

CLAMP EAST.

	Dir.	11 ^h 30 ^m	Rev.	Dir.	13 ^h 15 ^m	Rev.
W.	50.4		13.6	51.4		11.8
E.	16.0		48.0	16.4		46.9
W.	50.0		13.2	49.8		12.6
E.	15.4		47.7	14.3		47.9
Sum	131.8		122.5	131.9		119.2
Diff.		+9.3			+12.7	
$\frac{1}{2}$		1.16			1.59	
d		0°.111			0°.111	
b		+0.13			+ 0.18	

APRIL 7, 1902, KIDDER, RED RIVER—Continued.

Clamp West.

Star	ϵ Hydræ, $\delta=6^{\circ} 47'$			ι Ursæ Maj., $\delta=48^{\circ} 28'$			1 Drac., $\delta=81^{\circ} 48'$		
Factors	A=+0.45 a=+.28 B=+0.90 b=+.11 C=+1.01 c=+.39			A=-0.36 a=+.28 B=+1.47 b=+.13 C=+1.50 c=+.39			A=-5.13 a=+.28 B=+4.73 b=+.15 C=+6.98 c=+.39		
Wires.	Chron. T.			Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.	h.	m.	s.
1	8	39	3.6	8	49	37.5	9	16	18.4
2			25.9		50	10.0		18	52.3
3			47.5			42.6		21	22.7
4	40		10.3	51		16.6		24	59.9
5			31.9			49.1		26	30.4
Mean	8	39	47.84	8	50	43.16	9	21	24.74
Aber.			-.02			-.03			-.15
bB			+.10			+.19			+.71
RA	8	39	47.92	8	50	43.32	9	21	25.30
	8	41	37.13	8	52	32.49	9	23	15.26
1st App.	+ 1		49.21	+ 1		49.17	+1		49.96
cC			+.39			+.58			+2.72
Cor.+aA	1		48.82	1		48.59	1		47.24
aA			+.13			-.10			
Slow	1		48.69	1		48.69			
Star	ϵ Leonis, $\delta=24^{\circ} 14'$			μ Leonis, $\delta=28^{\circ} 28'$					
Factors	A=+0.20 a=+.28 B=+1.09 b=+.15 C=+1.10 c=+.39			A=+0.16 a=+.28 B=+1.10 b=+.15 C=+1.11 c=+.39					
Wires.	Chron. T.			Chron. T.					
	h.	m.	s.	h.	m.	s.			
1	9	37	42.0	9	44	35.4			
2		38	6.2		45	0.2			
3			30.0			24.2			
4			54.8			49.3			
5	39		18.1	46		13.4			
Mean	9	38	30.22	9	45	24.50			
Aber.			-.02			-.02			
bB			+.16			+.16			
RA	9	38	30.36	9	45	24.64			
	9	40	19.62	9	47	13.72			
1st App.	+ 1		49.26	+ 1		49.08			
cC			+.43			+.43			
Cor.+aA	1		48.83	1		48.65			
aA			+.06			+.05			
Slow	1		48.77	1		48.60			

APRIL 7, 1902, KIDDER, RED RIVER—Continued.

Star	α Leonis, $\delta=12^\circ 27'$			β Leo. Min., $\delta=37^\circ 13'$		
Factors	A=+0.38	a=+.28		A=-0.06	a=+.28	
	B=+1.03	b=+.16		B=+1.25	b=+.16	
	C=+1.04	c=+.39		C=+1.25	c=+.39	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	Lost.			10	19	31.2
2	10	0	59.7 =	10	1	22.2
3		1	21.7 =		20	26.0
4			45.2 =			54.3
5		2	7.0 =		21	21.6
Mean	10	1	22.18	10	20	26.42
Aber			-.02			-.02
bB			+.16			+.20
RA	10	1	22.32	10	20	26.60
	10	3	11.47	10	22	15.58
1st App.		+1	49.15		+1	48.98
cC			+.41			+.49
Cor.+aA		1	48.74		1	48.49
aA			+.11			-.02
Slow		1	48.63		1	48.51

Clamp East.

Star	β Leonis, $\delta=15^\circ 7'$			4 Draconis, $\delta=78^\circ 10'$		
Factors	A=+0.34	a=+.32		A=-3.37	a=+.32	
	B=+0.98	b=+.13		B=+3.53	b=+.14	
	C=+1.04	c=-.39		C=+4.88	c=-.39	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	11	41	32.1	12	2	22.1
2			54.3	4		7.2
3		42	17.9	5		57.6
4			40.2	7		41.7
5		43	2.9	9		29.8
Mean	11	42	17.48	12	5	55.68
Aber.			-.02			-.09
bB			+.13			+.49
RA	11	42	17.59	12	5	56.08
	11	44	6.19	12	7	41.75
1st App.		+1	48.60		+1	45.67
cC			-.41			-1.91
Cor.+aA		1	49.01		1	47.58
aA			+.11			
Slow		1	48.90			

APRIL 7, 1902, KIDDER, RED RIVER—Continued.

Star	β Can. Ven., $\delta=41^\circ 53'$			α Can. Ven., $\delta=38^\circ 51'$		
Factors.	A=-0.17	a=+.32		A=-0.10	a=+.32	
	B=+1.32	b=+.15		B=+1.28	b=+.16	
	C=+1.34	c=-.39		C=+1.29	c=-.39	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	12	26	20.8	12	48	44.8
2			49.5		49	12.2
3		27	20.3			41.6
4			49.2		50	9.2
5		28	18.7			37.4
Mean.	12	27	19.70	12	49	41.04
Aber.			-.02			-.02
bB			+.20			+.20
RA	12	27	19.88	12	49	41.22
	12	29	8.03	12	51	29.21
1st App.		+1	48.15		+1	47.99
cC			-.52			-.50
Cor.+aA		1	48.67		1	48.49
aA			-.05			-.03
Slow.		1	48.72		1	48.52
Star	ϵ Virginis, $\delta=11^\circ 29'$			20 Can. Ven., $\delta=41^\circ 5'$		
Factors.	A=+0.40	a=+.32		A=-0.16	a=+.32	
	B=+0.94	b=+.17		B=+1.32	b=+.18	
	C=+1.02	c=-.39		C=+1.32	c=-.39	
Wires.	Chron. T.			Chron. T.		
	h.	m.	s.	h.	m.	s.
1	12	54	47.1	13	10	25.2
2		55	9.2			54.0
3			32.2		11	24.0
4			54.3			52.3
5		56	16.9		12	21.0
Mean	12	55	31.94	13	11	23.30
Aber.			-.02			-.02
bB			+.16			+.24
RA	12	55	32.08	13	11	23.52
	12	57	20.46	13	13	11.51
1st App.		+1	48.38		+1	47.99
cC			-.40			-.52
Cor.+aA		1	48.78		1	48.51
aA			+.13			-.05
Slow		1	48.65		1	48.56

APRIL 7, 1902, KIDDER, RED RIVER—Continued.

Computations.

"c"

Star.	Clamp West.			Star.	Clamp East.		
	1st App.		C.		1st App.		C.
	m.	s.			m.	s.	
ε Hyd.	+1	49.21	+1.01	β Leo.	+1	48.60	+1.04
z U. M.		49.17	1.50	β C. V.		48.15	1.34
ε Leo.		49.26	1.10	α C. V.		47.99	1.29
μ Leo.		49.08	1.11	ε Vir.		48.38	1.02
α Leo.		49.15	1.04	20 C. V.		47.99	1.32
β L. M.		48.98	1.25				
Mean	+1	49.14	+1.17	Mean	+1	48.22	+1.20

$$c = \frac{(1^m 49^s.14) - (1^m 48^s.22)}{1.17 + 1.20}$$

$$c = +0.39 \text{ Clamp West.}$$

$$c = -0.39 \text{ Clamp East.}$$

"a"

Star.	Clamp West.		A.
	Cor. +aA		
	m.	s.	
ϵ Hyd.	+1	48. 82	+0. 45
z U. M.		.59	-0. 36
ϵ Leo.		.83	+0. 20
μ Leo.		.65	+0. 16
α Leo.		.74	+0. 38
β L. M.		.49	-0. 06
Mean	+1	48. 69	+0. 13
1 Drac.	+1	47. 24	-5. 13
Diff.		+1. 45	+5. 26

$$a = \frac{+1.45}{5.26}$$

$$a = +0.28$$

"a"

Star.	Clamp East.		A.
	Cor. +aA		
	m.	s.	
β Leo.	+1	49.01	+0.34
β C. V.		48.67	-0.17
α C. V.		48.49	-0.10
ϵ Vir.		48.78	+0.40
20 C. V.		48.51	-0.16
Mean	+1	48.69	+0.06
4 Drac.	+1	47.58	-3.37
Diff.		+1.11	+3.43

$$a = \frac{+1.11}{3.43}$$

$$a = +0.32$$

Corrections.

	m.	s.
ϵ Hydræ slow	1	48.69
z Ursæ Maj. slow		.69
ϵ Leonis slow		.77
μ Leonis slow		.60
α Leonis slow		.63
β Leo. Min. slow		.51
β Leonis slow		.90
β Can. Ven. slow		.72
α Can. Ven. slow		.52
ϵ Virginis		.65
20 Can. Ven.		.56

Mean +1 48.66 Epoch of exchange.

APRIL 7, 1902, KIDDER, RED RIVER—Continued.

Exchange signals received at Red River.

From Red River.			From St. Louis.			From Red River.			From St. Louis.			
h.	m.	s.	h.	m.	s.	h.	m.	s.	h.	m.	s.	
10	23	1.52	10	24	31.92	10	23	39.52	10	25	9.62	
		3.48			33.62			41.50			11.65	
		5.49			35.58			43.52			13.70	
		7.50			37.70			45.52			15.70	
		9.44			39.71			47.50			17.80	
		11.50			41.75			49.52			19.82	
		13.54			43.62			51.56			21.70	
		15.46			45.60			53.46			23.70	
		17.46			47.60			55.48			25.62	
		19.50			49.60			57.50			27.72	
		21.50			51.59			59.35			29.70	
		23.54			53.52							
		25.50			55.42	Mean	10	23	30.49	10	25	0.65
		27.50			57.48	Chr. slow		+1	48.66		+1	48.66
		29.50			59.52							
		31.49	25		1.65	Correct	10	25	19.15	10	26	49.31
		33.50			3.70	St. Louis	11	4	31.22	11	6	1.17
		35.50			5.60							
		37.48			7.60	Diff.		39	12.07		39	11.86

Mean 39^m 11^s.965, St. Louis to Red River, April 7, 1902.

THE ONE-HUNDREDTH MERIDIAN.

Summary of results.

No.	Date.	Difference.		Relative weight.
		m.	s.	
1	March 5, 1902.....	39	12.130	1
2	March 14, 1902.....		11.835	1
3	March 16, 1902.....		11.835	1
4	March 17, 1902.....		12.020	2
5	March 18, 1902.....		12.025	2
6	March 26, 1902.....		11.965	2
7	March 30, 1902.....		12.020	2
8	April 4, 1902.....		11.980	2
9	April 6, 1902.....		11.985	2
10	April 7, 1902.....		11.965	2
	Weighted mean.....	39	11.983	.....

The difference in longitude from the St. Louis observatory to the assumed Red River astronomical pier is therefore found to be: 39^m 11^s.983.

Calculation of the longitude from Greenwich.

	h.	m.	s.
Longitude of St. Louis from Greenwich.....	6	0	49.168
Longitude of Red River from St. Louis.....		39	11.983
Longitude of Red River from Greenwich.....	6	40	1.151
Longitude of Red River from Greenwich.....	6	40	1.15

Longitude of Red River from Greenwich in angular measure, 100° 0' 17".25.

The longitude of the assumed Red River astronomical pier from Greenwich, as referred directly to the adopted longitude of the St. Louis observatory from Greenwich, is therefore found to be:

100° 0' 17".25.

PROJECTION.

In order to establish the point of intersection of the one hundredth meridian with the Red River it was necessary to project a true meridian north from the Red River observatory to the north bank of the Red River, and having thus found the point of intersection of the meridian whose longitude is $100^{\circ} 0' 17''.25$ with the Red River, a measurement to the east of an amount corresponding to the difference in longitude of $17''.25$ in that latitude would accomplish the fixation of the point of intersection of the true one hundredth meridian with the Red River.

As a basis for the projection of the meridian passing through the Red River transit I therefore set a stake for a meridian mark at a point as nearly as possible in the true meridian at a distance of 1 mile 32.155 chains north of the Red River transit. Then to determine the azimuth error or "bearing" for said pointing, I made careful settings on the meridian mark with the astronomical transit, with the telescope both direct and reversed, on four nights before commencing the usual evening's programme.

Azimuth of the meridian mark.

No.	Date.	"a"	Clamp.
1.....	March 26, 1902	s. +0.39	West.
	Do.....	.44	East.
2.....	March 30, 1902 .....	.44	West.
	Do.....	.48	East.
3.....	April 4, 1902 .....	.52	West.
	Do.....	.45	East.
4.....	April 7, 1902 .....	.28	West.
	Do.....	.32	East.
	Mean	+0.42 = +6''.3	

The bearing of the meridian mark is therefore found to be: N. $0^{\circ} 0' 6''.3$ W.

The natural tangent of $0^{\circ} 0' 6''.3$ with a base of 1 mile 32.155 chains is 0.341 links, or 0.225 feet.

I therefore set a stake with a tack point 0.225 feet east of the center of the meridian mark, the tack point thus being in the true meridian with the Red River transit, and from the latter point I projected the true meridian north to the north bank of the Red River on April 14, 15, and 16, 1902.

In the projection of the meridian I used G. L. O. light mountain transit No. 7058 made by Young & Sons; sights averaging from one-fourth to one-half mile were made; at every instrument point I took two back and two fore sights, one with the telescope direct and one with the telescope in reversed position, between which I carefully leveled, undertaking by this procedure to eliminate all instrumental errors in so far as it is possible to do so; stakes were carefully set at every instrument point, and the mean position of the two foresights was considered as the correct projection. My party consisted of one rear flagman and one front flagman, the latter being assisted by a man

with field glasses, enabling precise settings of the flag. In this manner the meridian was projected northward across Red River to a point due east of the old initial monument on the Texas and Oklahoma boundary, described on page 7. There was no necessity for chaining this line, but the distance is about 14 miles.

The measurements on the parallel of latitude passing through the old initial monument on the Texas and Oklahoma boundary were made with a 200-foot steel tape, standard at 10 pounds tension and temperature 62° F. A constant tension of 10 pounds was maintained during measurements by means of an attached spring balance. Temperature readings were taken during measurements with a thermometer.

The latitude of the initial monument is 34° 34'.7 N. (see p. 7), and the altitude above sea level is approximately 0.2 mile.

April 16, 1902, I measured from the old initial monument east on the parallel 2,257.25 feet distant, to the astronomical meridian, temperature 51°. The temperature correction is subtractive and equals: $(11 \times 0.000065 \times 2,257.25) = -0.16$ foot. The correct distance is therefore found to be: 2,257.1 feet.

The difference in longitude for a given distance along the parallel is obtained by the equation:

$$d\theta'' = \frac{m R'' \sqrt{1 - e^2 \sin^2 \varphi}}{a \cos \varphi}$$

where $d\theta''$ = difference in longitude.

m = measurement on the parallel, 2,257.1 feet in this case.

R'' = 206,265'', seconds of arc in a radian.

e = earth's eccentricity.

φ = latitude of measurement.

a = earth's equatorial radius, which is 3,963.3 miles, to which is added 0.2 mile for altitude.

Solution of equation.

Log	e		8.915	2515
Log	$\sin \varphi$		8.915	2515
			9.753	990
			9.753	990
Log	$e^2 \sin^2 \varphi$		7.338	483
Nat	$e^2 \sin^2 \varphi$		0.002	180
Nat	$1 - e^2 \sin^2 \varphi$		0.997	820
Log	$1 - e^2 \sin^2 \varphi$		9.999	052
Log	$\sqrt{1 - e^2 \sin^2 \varphi}$		9.999	526
Log	206265		5.314	426
Log	2257.1		3.353	532
Log	$m R'' \sqrt{1 - e^2 \sin^2 \varphi}$		8.667	484
Log	3963.5	3.598079		
Log	5280	3.722634		
Log	$\cos 34^\circ 34'.7$	9.915585		
Log	$a \cos \varphi$		7.236	298
Log	$d\theta''$		1.431	186
Nat	$d\theta''$		26''.99	

The difference in longitude from the Red River astronomical meridian west to the old initial monument on the Texas and Oklahoma boundary is therefore found to be 26''.99.

Longitude of the old initial monument.

Longitude of Red River astronomical meridian	100° 0' 17".25
Difference in longitude to old initial monument	26.99
Correct longitude of old initial monument	100 0 44.24

The correct longitude of the old initial monument on the Texas and Oklahoma boundary is therefore found to be 100° 0' 44".24.

The proper measurement to make along the parallel to correspond to a given difference in longitude is obtained by the equation last used, but altered to the form:

$$m = \frac{d \theta'' a \cos \varphi}{R \sqrt{1 - e^2 \sin^2 \varphi}}$$

where $d \theta'' = 17''.25$ in this problem.

Solution.

Log	$a \cos \varphi$		7.236 298
Log	17.25		1.236 789
Log	$d \theta'' a \cos \varphi$		8.473 087
Log	$\sqrt{1 - e^2 \sin^2 \varphi}$	9.999526	
Log	R''	5.314426	
Log	$R'' \sqrt{1 - e^2 \sin^2 \varphi}$		5.313 952
Log	m		3.159 135
Nat	m		1,442.6

It is therefore found that from the Red River astronomical meridian east to the true one-hundredth meridian in this latitude and altitude is 1,442.6 feet.

April 16, 1902, I measured from the astronomical meridian east on the parallel passing through the old initial monument, a distance of 1,442.7 feet, temperature 55°. The temperature correction is subtractive and equals $(7 \times 0.0000065 \times 1,442.7) = 0.1$ foot; the correct distance is therefore 1,442.6 feet.

At the point thus determined I set a gray sandstone, 10 by 14 by 45 inches, 24 inches in the ground, to mark the true one-hundredth meridian; stone marked 100 W L 1902 on the N. face; witnessed by pits, 36 by 36 by 12 inches, S. of stone 4 feet and N. of stone 10 feet distant, and a mound of earth, 5 feet base, 2½ feet high, 5 feet N. of stone. There are no suitable bearing trees or other rock or stone in this vicinity. (The stone which is set here we brought 14 miles.)

From this monument the old initial monument on the Texas and Oklahoma boundary bears due west 3,699.7 feet. $(1,442.6 + 2,257.1 = 3,699.7 \text{ feet.})$

From this monument due south to the left bank of Red River is 1,563 feet.

The monument is set in the pasture belonging to Mr. Frank Kloskey, whose address is Olympus, Tex.

The SE. corner of Mr. Kloskey's house bears N. 43° 45' W. from the monument, 314.5 feet distant.

From the monument the pipe of Mr. Kloskey's windmill bears N. 76° 36' W., 280 feet distant.

The field work of this determination was completed on April 16, 1902.

ARTHUR D. KIDDER,
Examiner of Surveys.

OATH OF ASSISTANT ASTRONOMER.

I, Augustus MacConnel, hereby certify that I assisted Arthur D. Kidder, United States examiner of surveys, in making all of those observations and calculations for the establishment of the point of intersection of the true one-hundredth meridian with the Red River, which are represented in the foregoing field notes as having been made by him and under his direction, and that said establishment has been in all respects, to the best of my knowledge and belief, well and faithfully made and in accordance with the instructions furnished by the Commissioner of the General Land Office.

AUGUSTUS MACCONNEL,
Astronomer.

Subscribed and sworn to before me this 16th day of December, 1902.

[SEAL.]

EDWIN D. BURGESS,
Deputy County Clerk, Chemung County, N. Y.

OATH OF EXAMINER OF SURVEYS.

I, Arthur D. Kidder, examiner of surveys, do solemnly swear that, in pursuance of special instructions received from the Commissioner of the General Land Office, bearing date the 4th day of February, 1902, authorized by the Secretary of the Interior May 31, 1901, under the provisions of the act of Congress approved January 15, 1901 (31 Stats., 731), I have well, faithfully, and truly, in my own proper person, and in strict conformity with the said instructions, made all of those observations and calculations for the establishment of the point of intersection of the true one-hundredth meridian with the Red River, which are represented in the foregoing field notes as having been made by me and under my direction, and that said establishment has been in all respects, to the best of my knowledge and belief, well and faithfully made.

ARTHUR D. KIDDER,
Examiner of Surveys, Detailed U. S. Astronomer and Surveyor.

Subscribed and sworn to before me this 23d day of January, 1903.

[SEAL.]

J. R. YOUNG,
Clerk Supreme Court District of Columbia.
By L. P. WILLIAMS,
Assistant Clerk.

APPROVAL.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
February 5, 1903.

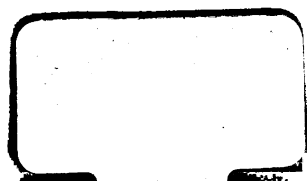
The foregoing field notes of the observations and calculations for the establishment of the point of intersection of the true one-hundredth meridian with the Red River, executed by Arthur D. Kidder, examiner of surveys, detailed United States astronomer and surveyor, under instructions from the Commissioner of the General Land Office bearing date February 4, 1902, authorized by the Secretary of the Interior May 31, 1901, pursuant to the provisions of the act of Congress approved January 15, 1901 (U. S. Statutes at Large, vol. 31, p. 731), having been critically examined and found correct, the said field notes and the determination they describe are hereby approved.

W. A. RICHARDS,
Commissioner.

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